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COVER. This photograph, which initiates a new *Bulletin* feature, is of Waling-Waling orchids (*Vanda sanderiana*) taken in the Philippines by Jose C. Mendiola, M.D. of Manila. Dr. Mendiola is a member of the Biological Photographic Association.

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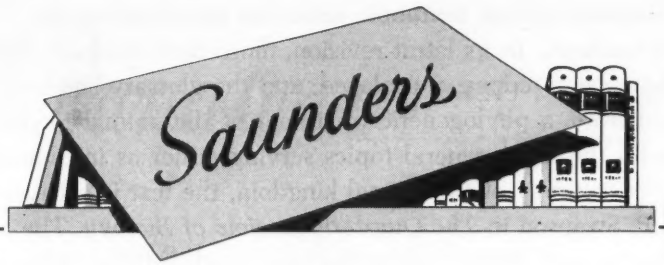

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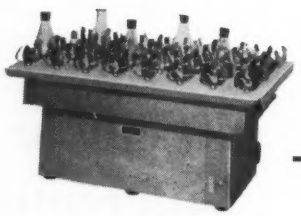

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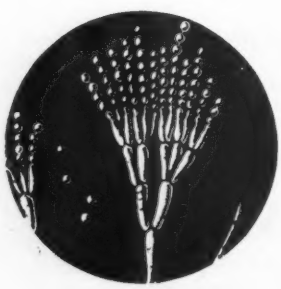

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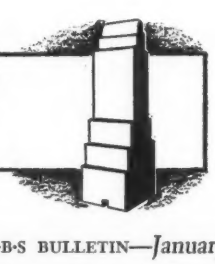


This Is Your Magazine . . .

THE AIBS BULLETIN is very much *your* magazine—since it is written and published by biologists for biologists. The BULLETIN is as large, as interesting, as informative, as important, as *you* are willing to make it. As stated on the cover, it is designed to bring to your desk "news and views in the biological sciences." *Your* news. *Your* views.

First, Your News . . .

All of us are interested in news of friends—their appointments, promotions, awards and honors, travels, etc. This information can only appear in the BULLETIN columns if a host of biologists become self-appointed reporters for their departments, their universities, their schools or their firms.

We also all want news of fellowships, research grants and the availability of funds for educational purposes. This information, too, must come to the BULLETIN from *source* people. New biology departments, new graduate school developments, special summer school offerings—these are also items of interest to many.

Community efforts for the alleviation of the teacher shortage, faculty schemes to help the high school teacher, devices for encouraging better-than-average students toward careers in biology—all suggestions that might be helpful to others should appear in the *Biological Education* column.

News about activities and projects, new officers and meeting sites of biological societies and organizations is to be found in the *From the Societies* column. Again continuous liaison is necessary for good coverage. It is the hope and ambition of the AIBS staff that every biologist will soon turn to the BULLETIN—automatically—for news and information in the field of biology.

Then Your Views . . .

Most BULLETIN manuscripts for the past six years have been solicited. This does not mean that unsolicited manuscripts are discouraged. Quite the contrary—we would like to *encourage* the practice. The BULLETIN cannot adequately reflect the views of biologists if such viewpoints are not made known. This can be done either in an article or through the medium of the *Letters to the Editor* column.

Many suitable BULLETIN topics are suggested from time to time to the Editor or Editorial Board. Let me list a few.

1. The application of information theory to biology. Exactly what is this theory? Can it be utilized in biological research and thinking?

2. Operations Research in biology. What is meant by Operations Research? Is biology too complex for the application of O. R.?

3. Are unified biology departments (botany, zoology, physiology, bacteriology, entomology, conservation, etc.) desirable? Is the trend toward such unification?

4. Speculation about "life" on Mars. What has International Geophysical Year research revealed?

5. The role of biological research in solving the world's food problems—the world's population problems.

6. Is the "battle" to maintain wilderness areas in North America justified? Why should biologists be interested in wilderness preservation?

7. Should all Ph.D. graduates who plan to teach be given some kind of instruction in teaching methods?

8. Are our present methods of publishing research results obsolete?

9. What can be done to attract really good students into biology?

These are just a few of the problems and questions that biologists seem to be discussing amongst themselves. Let's use the BULLETIN to carry these discussions to *all* biologists—to test the validity of arguments—and to reach the effective people who can translate discussion into action.

With this January 1957 issue, the AIBS BULLETIN is changing format—from two columns to three. We feel this will improve readability and also "modernize" the magazine. If a sufficient number of suitable photographs are received from interested biologists, we will continue the use of cover photographs. Two other mechanical changes have been made in recent years. In 1952 the type size was reduced from 10 point to 8 point, thereby giving 15% more copy in each issue without increasing costs. In 1955 the page size was increased to a more standard 8½ x 11, again allowing for more content without a comparable increase in cost. Other economies in composition and paper have been put into effect. Your present BULLETIN is being published in the most economical way possible.

These economies have been accomplished without losing appearance or quality—two very important factors in securing and maintaining advertising. May we speak for a moment about advertising?

Nearly every national publication depends to some extent upon the income from advertising. Let's face it—the BULLETIN does too. However, the potential sources of advertising for the BULLETIN have not been tapped by any means. With only a very small yearly expenditure for promotion, the BULLETIN has built up and maintained a fine group of advertisers. Many of these concerns—largely publishing houses—have been faithful advertisers and exhibitors since 1950. Their continued expression of confidence in the Institute, its magazine and its annual meetings, deserves the thanks of all biologists.

There are many concerns, however, producing biological apparatus and supplies that, so far have not become BULLETIN advertisers. Most have been contacted by letter and sent informational material about the BULLETIN and AIBS, but few have been visited personally. As the AIBS BULLETIN budget slowly increases this necessary contact is being made. Meantime every biologist can help by "selling" in his area of the country. Local contacts, through salesmen or company officials, can do much to bring the BULLETIN to the attention of appropriate persons. What could be more pursuasive than readers "selling" their own publication? As advertising increases so will the size of the BULLETIN and the frequency of publication.

We definitely hope to publish the BULLETIN more frequently in the very near future. Six issues a year instead of five would put it on a regular schedule. News would be more newsworthy and articles more timely. Eventually, of course, it is hoped that the BULLETIN can become a monthly magazine. All such plans depend on the continued steady financial development of the BULLETIN and the unwavering interest and contributions of all readers. The BULLETIN is indeed *your* magazine.

The UNESCO Program for Scientific Research

RAYMUND L. ZWEMER

Chief, Div. of International Cooperation for Scientific Research, Department of Natural Sciences, U.N.E.S.C.O.

UNESCO's part in international cooperation for scientific research has differed widely in the past ten years. Present large-scale cooperation in the International Geophysical Year and in the peaceful uses of atomic energy were only small fragments of the UNESCO programme five years ago.

When UNESCO began on 4 November 1946, by the ratification of the Articles of Agreement by 20 countries, the chief needs in international science appeared to be the rehabilitation of laboratories and teaching institutions. Next in importance was the improvement of communications between scientists who had been separated. This was done through stimulation of exchanges of persons and of publications and by giving financial aid to international Unions, Congresses and Societies.

Currently, scientific research is aided by grants to international organizations which enable research workers in science, engineering and medical sciences to carry out programs which they themselves plan. Better communications continue to be stimulated through encouragement of improvement in documentation, translation and terminology.

Regional and international cooperation are also fostered through scientific projects. These long-range objectives are needed in order that limitation of funds and personnel would not result in the effort being spread too thin to have a definite impact. These projects require considerable "lead time."

The Arid Zone project, which has been under way for about six years, is only now reaching the status of a major project. Through its International Advisory Committee, research has been stimulated in regard to recovery of arid waste lands throughout widely scattered areas in North and South America, Australia, Asia and Africa. It has been decided to concentrate the effort for the next period on the Middle East where there is a population pressure for the use of the desert and where many civilizations have existed and disappeared on these lands, leaving a residue of ruins and salt.

The Ocean would seem to be an appropriate area for research on an international scale. It has been stated that less is known about some of the Ocean areas than is known about the surface of the moon. In October the Marine Sciences Advisory Committee held a meeting in Lima, Peru, which in addition to discussing various international problems, gave special attention to the biologically rich area of the South East Pacific which requires an immense amount of research in both physical and biological oceanography.

Regional activities included a symposium on physical oceanography in Tokyo in conjunction with the meeting of representatives of oceanographic institutions of the Indo-Pacific region. Activities in Latin America included a symposium on Plankton, a training course on the Methodology of Marine Biology Research and a regional working party on marine biology which were held in Sao Paulo (Brazil) in 1955. In 1956 there will be another regional meeting in Chile and a future program involves studies of the Red Sea and the Indian Ocean.

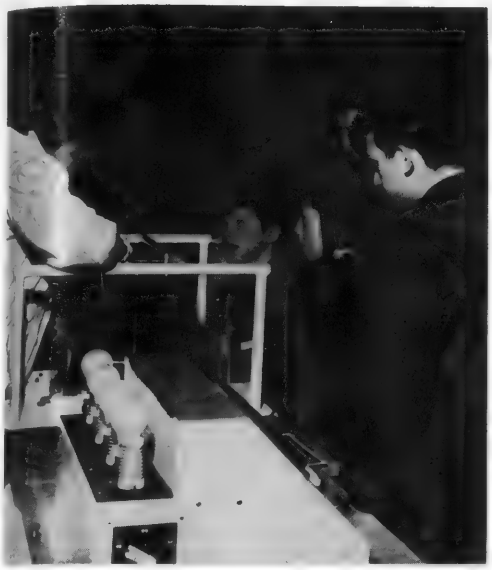
Specialists in humid tropics research met in Kandy (Ceylon) during March 1956 to participate in a symposium on tropical vegetation. Ten experts from as many countries throughout the world, representatives of three United Nations Specialized Agencies and of two International Scientific Unions attended the meeting. They recommended the establishment of a permanent Committee. It is suggested that the first meeting of this Committee be held at the "Institut d'Enseignement et de Recherches tropicales" at Abidjan, on the Ivory Coast, Africa. At this meeting it is planned to have a symposium on the interrelationship of tropical vegetation to soil. In preparation for this, a small group of consultants in pedology met in Paris in September to organize research projects on organic matter in tropical soils. Another group of phyto-geographers met to match up a series of regional maps in order to construct a complete map of tropical vegetation in Africa.

Of interest to biologists is the beginning of a programme in cell biology which, from a wide variety of suggestions proposed by a group of experts, has through subsequent consultation been narrowed to three principal objectives:

—Surveys of laboratory animals including: their genetic purity, availability to scientists in other laboratories, and conditions under which they might be obtained by persons in other countries.

—A proposed International Commission for Cell Biology which should review, correlate and facilitate cooperation in the activities of existing national bodies working in the field of cell biology. Its infor-

Augusto Pi Suner, 1955 Kalinga Prize winner (left), with the Director General of UNESCO, Luther H. Evans, and the Director of the Department of Natural Sciences, Pierre Auger (right).



French youngsters visit one of UNESCO's traveling exhibits, "The Transformation of Energy".

mation should be derived from all sources. It should, however, deal with scientific matters only with member scientific organizations or national scientific bodies.

—In keeping cell biology under continuing review, the Commission could organize multidisciplinary symposia for scientists actively engaged in the fields of biochemistry, carcinogenesis, cytology, embryology, genetics, endocrinology, nutrition, radiation biology, virology and other disciplines relevant to cell biology.

Using atomic energy for peaceful purposes has received great impetus in the last few years. As early as 1950 Professor Isidor Rabi proposed that nations could combine together for research on the atom. In 1952, an interim organization was formed under the aegis of UNESCO, and now the European Organization for Nuclear Research, Geneva, Switzerland, is an independent organization, with its own finances, its own officers and a staff of 150 scientists and engineers from 12 countries working together. Its program has been considered so important that the Ford Foundation recently made a grant to enable scientists from countries other than the 12 cooperating in this research institution to work there.

There are other ways in which UNESCO promotes fundamental research. For example, technical assistance to less developed countries in solving technical, educational, organizational and other problems involved in their economic development. This is supported by voluntary contributions of Governments and the money is used for fellowships, for equipment and for sending experts from one country to another. The fact that the programs are established independently by each country receiving technical assistance precludes the development of an internationally coordinated scientific research program by this means. However, if the countries involved are aware of the international program, they can correlate their national requests to promote regional advances.

To assist Member States in carrying out projects which do not have an immediate economic application, there is in the regular UNESCO Budget money for participation by Member States in activities which may be related to the regular UNESCO Program.

In addition to fellowships provided under technical assistance, fellowships are also granted under the Exchange of Persons Program of UNESCO and within budgetary limits of each specific program, contracts can be concluded with appropriate research institutions with a view to encouraging research of international value.

There are now 77 Member States of UNESCO.

Delegations from these meet in a Conference which is the governing body of the Organization. The Ninth General Conference met in New Delhi, India, in November 1956.

The General Conference determines the policies and main Program of the Organization, votes the Budget and adopts conventions and recommendations for submission to Member States. Between conferences an Executive Board of 22 members elected from among the delegates to the General Conference supervise the execution of the Organization's program. The Chief Administrative Officer of the Organization, the Director General, is appointed by the General Conference for a term of six years. He appoints and directs the staff of nearly 900 international civil servants, recruited from more than 60 States, which form the Secretariat of UNESCO.

In order to associate interested national bodies with UNESCO's work, National Commissions are provided for in UNESCO's Constitution. Many Member States have set up such Commissions which are broadly representative of governmental and non-governmental national organizations interested in educational, scientific and cultural matters. In addition to National Commissions, many Member States have Permanent Delegations to UNESCO with offices in Paris which serve at direct liaison agencies between their Governments and UNESCO.

The Department of Natural Sciences is one of eight Departments and Services concerned with the execution of the program. They are supported by five administrative Services. The other Program Departments are in the fields of Education, Social Sciences, Cultural Activities, Mass Communication and Technical Assistance. Cooperating with these are the Exchange of Persons Service and the Documents and Publications Service.

The Science programme follows three main lines of endeavor. An important and continuing need is that of bringing together scientists of different countries and different disciplines. This is one of the best methods of exchanging scientific information; it stimulates the progress of scientific inquiry and, in addition, furthers the general aim of UNESCO in the advancement of scientific research for the benefit of mankind. Existing international organizations are encouraged in their cooperative efforts by substantial help. This includes assistance for meetings of international committees, symposia, permanent services which are basic to the advancement of science in all countries, publication of documents which would otherwise restrict information which had been discovered, and the encouragement of laboratories where research and training are in strategic fields which will be of great benefit to a number of countries. Among such international organizations are the International Council of Scientific Unions (ICSU), the Council for International Organizations of Medical Sciences (CIOMS), the Union of International Engineering Organizations (UATI), and the International Union for the Conservation of Nature and Natural Resources (IUCN).

The International Geophysical Year is a tremendous undertaking initiated by the International Council of Scientific Unions through a Special Committee on the International Geophysical Year. UNESCO's part seems small in comparison with the multimillion dollar expenditures of about 50 nations, but UNESCO furnished the travel money to get together the first few scientists with the idea and has continued to furnish the support for the Secretariat in Belgium. This coordinates the effort to learn in the year and a half between 1 July 1957 and 31 December 1958 more about the many unknown forces of earth, air and sea.

The need for more science education is keenly felt in most countries. Science Teaching is well described in a UNESCO administrative document written a few years ago:

> "The great fund of knowledge acquired by science in past decades, steadily increased by modern research, becomes a resource for humanity and a means of improving the conditions of life only when it reaches the public, is understood and put to use. Yet science becomes ever more specialized and more remote from common life, with its own technical languages and disciplines. Although the knowledge is essentially international, the enormous cost of modern laboratories and of organized research campaigns tends to confine the results to the wealthier nations. A concerted international effort is therefore needed to

make the new knowledge available to all peoples across the barriers of geography, language and ignorance.

"This is not only a need but a demand. In the relatively underdeveloped countries it is recognized that underdevelopment is largely the result of a lack of science and that no amount of economic or technical assistance can be effective unless it is accompanied by public education in the principles, methods and applications of science. In the more advanced countries, where expenditures on science are large, it is the public that pays the cost and demands to be informed. And in every country the advance of science requires the training of large numbers of students each year. No nation can develop its economy or keep the pace unless science is well taught in the schools and scientific thought is an inherent part of the national culture."

UNESCO has contributed to the improvement of the teaching of science in all kinds of schools and colleges. For schools which cannot afford to buy laboratory equipment it has furnished more than 150 working drawings for apparatus to be constructed locally. Science teaching in some cases needs to be adapted to the locality, as exemplified in the series of handbooks on "The Teaching of Science in Tropical Countries".

In *Impact*, a quarterly journal published by UNESCO, the relationships of scientific advances to the individual and to society are explained.

The publication of articles dealing with scientific subjects which can be understood by the general public is encouraged and special recognition is given to writers in this field, by the presentation of the Kalinga Prize. The recipients to date are: Louis de Broglie (France) 1952, Julian Huxley (United Kingdom) 1953, Waldemar Kaempffert (United States of America) 1954, August Pi Suner (Spain) 1955. George Gamow (United States of America) has been given the prize for 1956.

A travelling exhibition is an excellent way of bringing science to people. Examples of these are "Our Senses and Knowledge of the World", "The Transformation of Energy", which are being visited by thousands of people in many countries. A new exhibit on the "International Geophysical Year" is in preparation and should do much to give people a better understanding of the complex scientific endeavor which is an outstanding effort of international cooperation in science.

Two UNESCO technical assistants study the soil in Syria where irrigation in the arid land regions is planned.

A Division of Field Operations is responsible for developing the activities of Science Cooperation Offices in Latin America, South Asia, South East Asia and the Middle East. These Offices stimulate the regional development of scientific research by various means, among which are the organization of training courses, arranging lecture tours in their region by scientists from other countries and by making known through publications the scientists, scientific institutions and scientific papers published in their regions.

The many types of international cooperation which have been described result from the efforts of individuals each contributing his or her part to eventual success. The people involved include Directors of research laboratories and individual research workers, Cabinet Ministers and children getting their first understanding of science from a visit to an exhibition, representatives of international scientific organizations and trainees on fellowship.

True cooperation rather than casual consideration is needed from every thoughtful scientist in order that scientific research may be encouraged in all nations. The fruits of these studies then become more easily available for improving the biological, economic and social conditions of all mankind. This goal requires indeed the united efforts of the people of 77 nations.

The Biology Division of Oak Ridge National Laboratory

ALEXANDER HOLLAENDER, *Director*

THE Biology Division of the Oak Ridge National Laboratory concentrates on research in fundamental biology and biochemistry with emphasis on the cytogenetic effects, and the biochemical, biophysical and pathological-physiological changes produced by radiation. The different groups and sections in the laboratory are, for all practical purposes, located in one building, which makes it possible for investigators working on related or overlapping problems to maintain very close cooperation. Much of the research here is understandably oriented toward radiation biology, but the importance of fundamental research on other biological problems has in no sense been subordinated to the studies of radiation effects. There is a distinct

relation between fundamental studies going on in some groups and radiation effects studies in others just as there are collaboration and mutual exchange of information between groups working on related basic studies that may or may not involve radiation. For example, investigations by the biochemists of nucleic acid structure and function are of interest to the insect cytologists who, with the aid of radioactive isotopes as tracer substances, are doing experiments on synthesis of nucleic acids and the effects of radiation on this synthesis. In the same manner, the work being done by cell physiologists on isolation of cellular organelles and their proteins is related to a biochemistry project that is receiving considerable attention at this time: amino acid activation and its relation to protein synthesis.

Communication between individual scientists and between groups is facilitated by informal luncheon seminars, held daily, with each day of the week designated to a specific group. At that time, investigators report on their work, and all members of the laboratory are invited to attend. Some groups hold daily meetings to discuss progress on individual work or interesting journal articles.

Scientists in this Division are assisted in their efforts to keep up with what is being done in their fields in laboratories all over the world through an excellent collection of scientific literature in the Biology Library. The library contains approximately 17,000 volumes, a document collection numbering about 15,000, a large reprint collection, and subscribes to 400 scientific journals, chiefly in the fields of biology, medicine, chemistry, and related subjects. Approximately 200 volumes and 580 bound periodicals are added annually. The Index Catalog to the Surgeon General's office and some journals and long articles are available on microfilm or microcards. The library compiles a weekly check list of current literature in biology, chemistry, microbiology, genetics, and physiology, which is distributed as part of the Division's Weekly Bulletin.

Regular weekly seminars are held and for the past year most of the speakers have been from laboratories abroad. This has provided an excellent supplement to the literature as a means of keeping current with work going on in laboratories in other countries.

The buildings that house the Division were designed originally for chemical processing but were never actually used for that purpose. An abundance of space has already been cleared in these buildings and there is additional room for expansion. The Division has its own facilities for electronic instrument construction and repair, and its own machine, carpentry, and glass blowing shops. Ample radiation sources and facilities are provided.

The present Biology Division was set up in 1946 and is part of Oak Ridge National Laboratory, which is operated by the Union Carbide Nuclear Company for the Atomic Energy Commission. Oak Ridge National Laboratory, the Atomic Energy Commission's largest nuclear research center, is an outgrowth of the wartime Clinton Laboratories (a branch of the Manhattan Project's Metallurgical Laboratory) and has had a role in virtually every major scientific operation and activity of the atomic energy program. Its research projects range from basic studies in physics, chemistry, metallurgy, and biology to reactor technology, isotope production, health protection, and education. The other main installations at Oak Ridge are the K-25 Gaseous Diffusion Plant designed for large-scale separation of the uranium isotope 235, and the Y-12 Plant for the production of stable isotopes, research on process improvements, and other special activities. The Oak Ridge Institute of Nuclear Studies, also located here, is an organization composed of 35 member universities in the South and Southwest.

The Biology Division participates in several cooperative programs with the Institute, one of which is the Traveling Lecture Program. This activity is part of the Atomic Energy Commission's program of exchange of scientific and technical information with colleges and universities, particularly in the South. In 1955-56 personnel from this Division presented approximately 135 lectures to institutions located in the southeastern, middle western, and eastern parts of the United States.

The Division values highly its relationship with the scientific departments of colleges and universities and holds the view that cooperation with these institutions can be a source of great strength to national laboratories. Whenever possible, cooperative programs are arranged with nearby schools, and several such projects are going on now. Cooperative arrangements have been established with staff members of the following universities: Duke, Florida State, Tennessee Medical School, Florida, Kentucky, Cornell, Emory, Vanderbilt, Virginia, North Carolina, and others. The University of Tennessee is near enough that members of the science faculties and graduate students attend Division seminars, and personnel of this laboratory often lecture at the university and attend seminars there. For three summers, courses have been taught by members of the Biology Division at Mountain Lake Biological Station of the University of Virginia and at the Duke University Marine Laboratory at Beaufort, North Carolina.

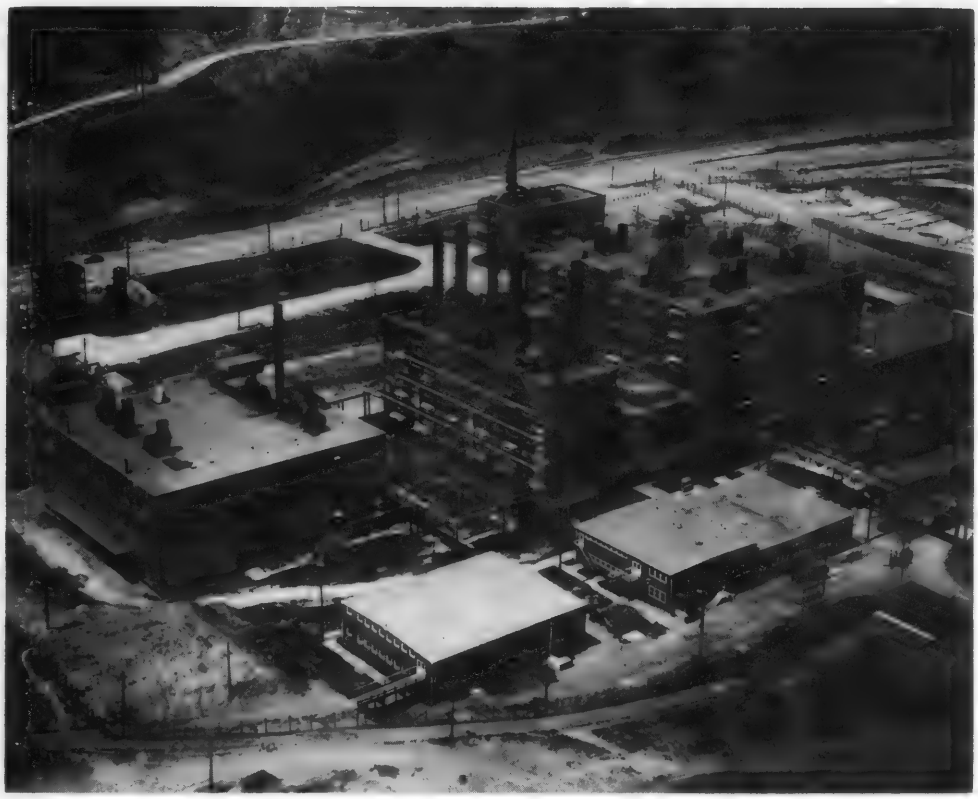
Biology Division personnel are occasionally given leaves of absence to teach one- or two-semester courses in their special field at universities. A graduate course in cytology was given recently at the University of North Carolina, Chapel Hill and a course in Radiation Biology has just been completed at Duke University. The course at Duke reflected the overlapping of disciplines that is characteristic of this laboratory and was attended by physicists, biologists, and medical men. Courses are now being given at Vanderbilt University and Florida State University by personnel of this Division.

Under a Research Participation Program, faculty members of universities spend from 3 to 15 months in the Division working on their own or laboratory research projects. Fifteen to twenty such participants come to the Biology Division each year (90% from Southern schools) under this program, which is another cooperative project administered by the Oak Ridge Institute of Nuclear Studies. Also in cooperation with the Institute [and its associated universities], graduate students work in this laboratory on research projects in partial fulfillment of degree requirements. Two graduate students are here at present, and quite a number have completed their thesis research in this laboratory.

Overemphasis on applied projects and animal experimentation is avoided by the Biology Division in order to maintain a satisfactory proportion of research effort in basic cellular, microbiological, and genetics studies. Normally no animals larger than mice are used extensively for experiments. When the need for an applied project or for work on larger animals arises the usual procedure is to seek the cooperation of an institution or university where the facilities for this particular project are available. This plan has served very well from a practical point of view, and a number of cooperative projects are being carried on with different universities where some of our findings are being applied to dogs and monkeys and finally to man. Frequent conferences are held to coordinate such work and to maintain communication between this laboratory and the institution engaged in the project.

Our close association with educational institutions has extended to an interest in the problems that arise when students arrive at the college level without sufficient training to pursue scientific studies. On the theory that national laboratories can accept at least a small portion of the responsibility for improving this situation, three high school teachers were invited to work here this past summer. At the end of the summer, they agreed that this program was an excellent method of broadening and improving the scientific instruction that high school teachers offer their students.

Another important link with colleges and universities is the Research Associate Program, which was inaugurated in 1954. This is a fellowship arrangement whereby outstanding candidates who have recently received a doctoral degree and who have demonstrated definite interest and ability in fundamental research are appointed to work in the Division for one year. Information concerning the program is sent to department heads of approximately 400 colleges and universities each year, and they are asked to call it to the attention of students who qualify as applicants. There are now nine investigators working here under this program, which has provided excellent research opportunities for several young researchers at the beginning of their scientific careers.



Group of buildings in which the Biology Division is located, Oak Ridge National Laboratory.

The personnel of the Division numbers approximately 150, which includes about 60 investigators at the Ph.D. or M.D. level. Recent declassification of the Biology Division area permits research by people from abroad. Two young French scientists are working in the laboratory and investigators from other countries are expected in the near future.

Research Activities

The *Cytology and Genetics* Section consists of a series of more or less independent programs under the leadership of senior investigators. The various studies are often interconnected by the common interests of the researchers, and there are frequent informal discussions and cooperative projects but no attempt is made at formal integration. Heterokaryons of *Neurospora* are being used to investigate problems in radiation biology, especially to determine or confirm the basis for lethal effects, and in gene action. Studies on cytoplasmic inheritance and the analysis of complex gene loci are in progress with this organism. Investigations involving breakage of chromosome by radiation and the subsequent reunion of the broken pieces are being carried out by several investigators, using *Tradescantia*, *Vicia*, maize, and other organisms. Fundamental information on the processes involved has been obtained from studies on the effect of modifying agents and ion density of the radiation. Fundamental studies on crossing over in maize and on the chemical structure of chromosomes are also under way. One group uses the ciliated protozoa, especially *Paramecium*, to compare various kinds of radiation damage to the cell — both genetic and nongenetic damage—including the biological nature of the damage and the basic radiation mechanisms that brought it about. The parasitic wasp, *Habrobracon*, is used for radiation genetic studies. This has proved to be a very useful organism for comparison of nuclear and cytoplasmic damage, analysis of lethal mutation, and study of the sensitivity of various meiotic stages to radiation.

Another group, working on the large neuroblast cells of the grasshopper embryo *in vitro*, is investigating the process of mitosis and the effects of radiation on this process. The extreme sensitivity of these cells to radiation makes them excellent material for studying the fundamental aspects of radiation damage and subsequent recovery. At present, the work centers around studies designed to determine the site of radiation damage in the cell that leads to mitotic aberrations.

The *Drosophila* Group is studying the nature of mitotic and meiotic processes under normal and genetically altered conditions, with emphasis on chromosome structure and centromere behavior. In addition, research is being done on the nature of radiation-induced genetic changes and on the relative biological effectiveness of different types of radiations in producing genetic effects.

The *Mammalian Genetics and Development* Section is carrying on large-scale experiments on various genetic effects of radiation in mice. The main practical purpose of this extensive work is to obtain better estimates of the genetic hazards of radiation in man. Earlier estimates of this hazard were based mainly on mutations in the fruit fly; the results produced by this mouse work have necessitated considerable revision of those estimates. Some of the recommendations made recently by the National Academy of Sciences in the United States and the Medical Research Council of Great Britain in regard to genetic hazards of radiation were based, in part, on the results obtained by these experiments.

Studies are also being conducted to determine developmental effects of radiation on mice and histopathology of radiation damage to the gonads of mice. This work has led to new recommendations regarding the danger of medical fluoroscopic exposure to women of child-bearing age, in order to protect the embryo in the early stages of development before pregnancy is even suspected.

The *Mammalian Recovery* Group is concerned with the mechanism of action of bone marrow injection in preventing death

from a single lethal total-body radiation exposure. The possibility of acute and chronic total-body irradiation becoming a serious medical problem from industrial and military application of atomic energy has been a major stimulus to radiobiological research on amelioration of the injury. Potential application of the findings to other major biological problems such as immune response, tissue transplantation, leukemogenesis, and radiation therapy also provides encouragement for pursuing investigations on modification of radiation injury. Investigations are being made by this group to determine the types and numbers of bone marrow cells necessary for the recovery of the animal, the immediate and subsequent fate and the action of the injected cells, the immune response of the irradiated host, and the ultimate usefulness of tissue cultured bone marrow cells in preventing irradiation death. Collaborative studies are carried on with other groups on chemical protection against irradiation injury.

The effects of radiation on bacteria, fungi, and viruses and modification of the response of these organisms are the primary interest of the *Microbial Protection and Recovery Group*. Extensive work has been done on chemical protection during irradiation, and on modification of the response by both physical and chemical treatment after exposure. This involves basic studies on microbial metabolism, growth, and physical changes. These studies involve not only tests of survival and physiological response but also effects on mutation production and especially attempts to modify radiation-induced mutations. Besides ionizing radiation, ultraviolet radiation is used extensively in this group. Considerable effort is spent on the effects of long ultraviolet radiation, including photoreactivation, as well as the effects of visible and infrared radiation. The approach to this problem of microbial sensitivity takes advantage of the different parts of the electromagnetic spectrum, and all investigators working in this section use different types of radiation routinely.

Research in the *Pathology-Physiology* Section is concerned with radiation injury in mammals. Current work on the hemorrhagic state in radiation sickness involves study of the production, distribution, survival, and ultization of isotopically tagged blood platelets in normal, as compared with irradiated, rats. Investigation of radiation effects on immunological reactions and on bone marrow includes study of the survival and function of genetically labeled bone marrow homografts in irradiated rats. The formation of lens opacities is being studied in mice, rats, guinea pigs, and rabbits exposed to different types of radiations administered at varying intensities. Late effects of irradiation [including the induction of neoplasia, lymphoid, myeloid, and other types of leukemia, and accelerated aging] are being investigated in mice of several strains. The influence of dose, quality, and intensity of irradiation on the dose response for these parameters, the pathogenesis of these effects, and the possible prevention of these injuries by protective or recovery-promoting measure are being explored.

Investigations in the *Cell Physiology* group center around elucidation of the molecular basis for cell function. The difficulty at the outset is the lack of detailed information on tissue proteins and their localization in cell organelles. The three major problems studied by the group have concerned cellular organelles as follows: (1) isolation with minimum alteration; (2) purification of proteins from them; and (3) biophysical characterization. Extensive use is made of serological methods to determine the presence of contaminants in protein preparations and to demonstrate heterogeneity in samples that appear homogeneous by most biophysical methods. These studies are a necessary prelude to further investigations on the turnover rates of specific proteins, the forces holding proteins in cellular structures, the mechanisms for moving relatively insoluble proteins from site of synthesis to site of function, and the effects of radiation and other experimental variables on the distribution and function of specific molecular species. Investigations are being conducted on problems of circulations, including tests for potassium diffusion, especially in connection with radiation effects on mammals.

The *Biochemistry* Section is composed of four groups: *Microbiology*, *Plant Biochemistry*, *Nucleic Acid and Enzyme Biochemistry*, and *Enzymology and Photosynthesis*.

Enzymatic and isotope studies on microbial intermediary metabolism are the primary interest of the *Microbiology* Group. Microorganisms and enzyme preparations derived from them are used as models for studies of fundamental biochemical reactions. Studies on the succinate decarboxylation system from two different bacterial species have yielded new information on the problem of biochemical carboxylation reactions, which also take place in animals and plants. Detailed work on a new flavoprotein peroxidase, isolated from *Streptococcus faecalis*, has given new evidence on the mechanism of breakdown of peroxide in a living system. The enzyme-substrate complex formed by the reduced diphosphopyridine nucleotide peroxidase flavoprotein and pyridine nucleotide is used as a means of studying the factors involved in substrate binding on an enzyme surface, so that they may yield an insight into the mechanism of electron transport and associated reactions at the pyridine nucleotide-flavoprotein oxidation level.

The *Plant Biochemistry* Group does basic research on respiration, metabolism, and photosynthesis. Isotopes, combined with paper- and ion-exchange chromatography, are main research tools in addition to other usual biochemical equipment. Greenhouses, a constant environmental plant-growing room, and dark rooms for etiolated plants are special facilities available for growth of plants. Photosynthesis research has dealt primarily with relations of the photosynthetic carbon cycle to other metabolic functions of the plant. With C^{14} tracer, pathways of biosynthesis and utilization of sugars, amino acids, and organic acids are followed during the course of auxin, aging, radiation, or environmental treatments. With P^{32} and chromatography, over 60 compounds containing phosphorus can be detected in plants, although the identity of many of them is unknown. A study of phosphoryl choline in plants has shown that it serves as a major storage reservoir and transport form of phosphorus and nitrogen, and in these respects has the same physiological characteristics as glutamine.

In the *Nucleic Acid and Enzyme Biochemistry* Group, problems under active investigation include: structure and chemistry of nucleic acids; the metabolic changes in nucleic acids induced by bacteriophage infection; the nature of the complexes formed by α-chymotrypsin and trypsin with their substrates; the design, synthesis, and testing of radiation-protective compounds related to mercaptoethylamine. It was in this group that the work was done that led to the synthesis of S,2-aminoethylisothiuronium bromide hydrobromide, the most successful of a long series of experimentally designed compounds.

Investigations of nucleic acid structure have involved the development of new chromatographic techniques to detect and assay the various degradation products produced by chemical and enzymic attack.

In the *Enzymology and Photosynthesis* Group, the work is concerned with the nature of the enzymatic mechanisms involved in biosynthetic reactions. Of primary interest is the manner by which phosphate-bond energy is utilized in activating small molecules for their subsequent participation in a variety of biosynthetic processes. Problems include investigations of enzymatic activation of amino acids, which are of especial interest for studies on the mechanism of protein biosynthesis; enzymology of bioluminescence; the mechanism of the phosphoroclastic split of pyruvate in microbial extracts; and radiation effects on mammalian enzyme systems. The photosynthesis studies are concentrated on the first steps in this important conversion of light energy to chemical energy.

The work of the *Biophysics* group is quite varied and ranges from the strictly physical aspects of radiological physics to studies of thyroid function and amphibian metamorphosis. The major activities fall into three categories: (1) radiological physics (2) studies of the relative biological effects of various radiations with emphasis on fast neutron and ultraviolet radiation and (3) fundamental studies of the action of radiation on the molecular level. The work in these fields is not departmentalized on either the group or division level, and the research activities of the biophysics personnel are carried out with the close collaboration and cooperation of members of other groups in the laboratory.

The radiological physics program deals with the maintenance of radiation stand-

ards for x and gamma radiation, instruction to and collaboration with the biological staff on dosimetric procedures for use with these radiations, and the calibration and maintenance of the laboratory's radiation sources. The major effort, however, is in the development and application of precise instruments and techniques for fast neutron measurements and dosimetry in connection with the Division's fast neutron sources.

In studies of the biological effects of various radiations, the group activities center around the relative effects of a number of radiations, with particular emphasis on precise quantitative neutron radiobiology with the use of the Division's neutron facilities. Biophysics personnel are currently investigating the protective action of bone marrow on neutron-induced damage by using the Cockcroft-Walton fast neutron facility and have recently completed studies of the relative effect of ionizing and ultraviolet radiation in chromosome breakage.

Studies on the effects of radiation on fatty acids, conducted in collaboration with visiting university personnel, and a study of radiation-induced free radicals by means of paramagnetic resonance techniques are typical of the work in molecular biophysics.

The Division organizes a research conference once each year and the subjects include a wide variety of topics of biological interest. Papers are presented by outstanding people from the United States and abroad. Subjects have included: Radiation Genetics; Radiation Microbiology and Biochemistry; Biochemistry of Nucleic Acids; Physiological Effects of Radiation at the Cellular Level; Some Aspects of Microbial Metabolism; Effects of Radiation and Other Deleterious Agents on Embryonic Development; Genetic Recombination; Enzyme and Protein Structure; and Biocolloids. The group in the Division that is most interested in the selected topic takes primary responsibility for the planning and organization of the conference. The Cell Physiology group is assuming the leadership for next year's conference when the topic will be "Antibodies: Their Production and Mechanism of Action", since the papers presented at this conference will pertain to work going on in that group. The proceedings of the annual conferences are published as monograph supplements to the *Journal of Cellular and Comparative Physiology* and are distributed to scientists working in the field covered by each symposium.

Other smaller conferences are organized from time to time by the Division when people working in a specific field are invited to meet for a one- or two-day discussion. Photoreactivation and photosynthesis were the topics of two recent conferences and meetings on bone marrow transplantation will be held this year.

Oak Ridge is undergoing the transition from a city owned and operated by the government to an independent municipality. Although civic affairs have been regulated to a certain extent by the Atomic Energy Commission, the city has developed into a well-rounded community. Personnel in the Biology Division have provided much of the leadership needed in civic and cultural organizations including Town Council, Civic Music Association, Community Art Center, Children's Theatre, and similar groups. Oak Ridge is within a two-hour drive from the heart of the Great Smoky Mountains, which provide a beautiful backdrop for the Laboratory and the residential area.

During the recent Storrs meeting, a special AIBS Symposium "Education and the Future of Biology," was held. The three papers presented at that time have been somewhat condensed and appear now so all biologists may have information about the various programs underway in pre-college and college education.

New Approaches to the Curricula

JOHN A. BEHNKE, *former Assoc. Admin. Secretary, A.A.A.S.; Vice-president and Science Editor, Ronald Press.*

THE following three papers, now appearing in the AIBS *Bulletin*, are somewhat condensed versions of discussions presented at a symposium "Education and the Future of Biology," held at the University of Connecticut AIBS Meetings (August 1955). The three speakers chose to concentrate on what seemed to them the three most important aspects of current efforts in biological education. They hoped that such a session would offer a better perspective on the scope and impact of what is being attempted nation-wide than would have been gained by a detailed account of the various individual programs. It is hoped that this brief synthesis will raise questions, emphasize shortcomings and lead to further concerted cooperative approaches.

In examining the present curriculum of both lower schools and colleges, relatively little can be found that is fundamentally new compared to two or three decades ago. Fringe courses have been added in many areas, especially courses in preparation for living. Few traditional courses have been dropped, but a good deal of fragmentation has taken place—fragmentation reflecting an accelerated trend toward greater and greater specialization.

This seemingly static condition is not confined to the variety of courses offered but to content as well. True, new research results have been added, but they have been superimposed as a new facade on an old building which remains conceptually and fundamentally unaltered. This inertia has been maintained in spite of the advocacy and wide acceptance of new ideas about what should be taught and how—in spite of belief in the value of teaching the methods of scientific endeavor and the challenges of unsolved problems rather than the mere assimilation of facts.

Two factors appear to retard or even defeat the adoption of worth-while recommendations. Most important is the inertia that has prevented change before. The other is increasing enrollment which, by overburdening the teacher, leaves little time or energy for the adoption of changes —even if they have already been worked out in detail by others.

This presentation will cover developments in both college and lower school planning and will include first, changes in the curricular offerings in the biological sciences and course content, and second, changes in curricula affecting the training and up-grading of science teachers. Let us start at the bottom of the educational ladder and work up.

Only recently have scientists become aware of the importance of and the deficiencies in science instruction in the elementary grades. Some feel that the elementary school teacher, woefully inadequate in science background, imparts more fear of science and mathematics to her pupils than answers to their questions about scientific phenomena. The National Association for Research in Science Teaching has conducted studies which show that there

should be and can be systematic teaching of problems significant for daily living with a strong emphasis on scientific principles and methods rather than facts. The contents of the elementary curricular offerings should neither be watered-down high school material nor merely nature study. Real science can be taught on this level. What is most urgently needed are teachers with adequate background in science, and implementation of such research studies as those which have led to the observations just mentioned.

The Cooperative Committee on the Teaching of Science and Mathematics of the AAAS, having launched the Science Teaching Improvement Program aimed at improving the high school science teaching situation, has now turned its attention to active consideration of the elementary school problem. So far it is too early to report definite plans or real progress.

Turning to the high school situation we find that changes in the high school program—even proposed changes—are few and spotty. The football coaches, music teachers, and the fully-qualified biology teachers continue to cram great masses of facts, drawn from the college offerings into reluctant students. The laboratory work offered is usually even more monotonous and unpalatable.

The Committee on Educational Policies of the Biology Council (Division of Biology and Agriculture, National Academy of Sciences—National Research Council; to be referred to as the Committee on Educational Policies in this article) has given special attention to high school biology courses. With the cooperation of the National Association of Biology Teachers and the National Science Teachers Association, a committee has been set up to prepare a new modern outline of content for these courses. It is hoped that they will break away from traditional patterns and will offer the field something that will show promise of a real challenge in concepts.

The National Science Foundation has approved a grant request from the Committee on Educational Policies for a project aimed at improving high school biology laboratory material. The plan calls for an eight-week work conference at Michigan State University in the summer of 1957. New, challenging and imaginative laboratory exercises are to be developed by the group. Twenty high school biology teachers will be selected from all over the country through a competition designed to demonstrate their creative ability. The Committee on Educational Policies will pick ten appropriate college people, representative of the various biological sub-disciplines, to serve as resource people to work with the high school teachers through the eight-week period. The resulting material will have a year of thorough trial before its publication.

A valuable contribution to the content of high school biology courses has been made by the compilation and publication of the "Conservation Handbook" by the National Association of Biology Teachers. This volume not only shows what a large sampling of teachers are doing but offers some concrete suggestions on the development of conservation units for biology courses.

A word should be said about the various experiments designed to move superior high school students along at a more rapid rate. Two plans, both supported by the Fund for the Advancement of Education, call for entrance into college at some point earlier than on the completion of the traditional twelve years, or the offering of college level courses in high school with the aim of preparing superior students to enter college with advanced standing.

In turning our attention to the colleges, we are aware that on individual college campuses there is more or less constant activity leading to changes in curriculum. Unfortunately, much of this effort has been directed toward screening and approving new courses with relatively less attention to deletions or overall planning of course sequences. Changes in course content, except in the large general courses, has been, quite rightly, the prerogative of the person teaching the course. All this demonstrates the fact that any changes proposed, especially on the national level, cannot be imposed by educational pressures, but must be accepted on the basis of merit by individuals or, at most, departments.

The Committee on Educational Policies is planning a conference on the undergraduate biology program. Some twenty outstanding professors from all over the country will be asked to meet with the Committee for five days to define principles and to outline specific objectives, content, and organization for effective instruction in the life sciences at the three levels with which colleges are concerned: general education for all students; the knowledge and experience required by all prospective biologists regardless of later specialization; and a start on preparation for specific fields and professional roles.

It is hoped that these deliberations will not only lead to new content for life science courses but to recommendations for new combinations of material and to a reduction in course offerings through the integration of major concepts. Certainly a mere reshuffling of the traditional factual content of courses would hardly lead to productive results. Actually some courses are already showing signs of such integration, for example: the combination of plant and animal cytology; plant anatomy and physiology; various combinations of vertebrate zoology including histology, embryology, and cytology; and plant and animal ecology.

The development of general education courses in biology for freshman classes raises the question of possible broad second-year courses in zoology, botany, bacteriology, etc., for those going on into the life sciences. Such a possibility has not been given anywhere nearly enough attention; only a few forward-looking institutions have been working on the idea.

Another important effort of the Committee on Educational Policies is aimed at a critical review of the content of specific courses at the intermediate college level. The Committee will select *ad hoc* panels who will be charged with the task of reviewing the purposes for which a given course is offered and the development of an outline that would, in their opinion, best fulfill these purposes. Courses tend to lag behind the advancement of research and the conceptual framework of the subject. We are not so much concerned about the inclusion in courses of the latest research results as we are about the incorporation of new principles and the results of recent thinking on the part of the leaders in the field. The reports of these panels will be published for critical review and for such use as instructors and textbook writers choose to make of them. As a beginning the Committee has chosen two subjects for a trial of the idea: the principles of parasitism, and plant taxonomy.

Both the Conference on Undergraduate Programs and the *ad hoc* panels are being supported by a generous grant from the National Science Foundation.

The most comprehensive review thus far made of the teaching of any subject is the one conducted by the American Physiological Society on the teaching of physiology. The Society was able to make this very valuable study through a substantial grant from the National Science Foundation. The final report, developed from a great mass of data, is due within a few months and should receive the careful consideration of all biologists.

The Committee on Educational Policies is also collecting original college laboratory exercises in a large segment of undergraduate fields as part of a plan to compile and publish a series of laboratory source-books. The usefulness of this material will be in direct proportion to the public-spirited response of college biology teachers.

One other effort of the Committee that might be mentioned is a project to set up criteria for good textbook material. Such a guide could be of great value to textbook authors and publishers as well as the users of texts. If the last group, the users, applied rigorous criteria in their textbook selection, the quality of texts would be, perforce, raised.

The AAAS Traveling Science Libraries for Small High Schools, supported by the National Science Foundation, have now completed their first year. The experiment, on the basis of a very preliminary evaluation, seems to justify continuation for at least two more years. The number of books in the libraries has been increased, and the number of schools serviced by them has been expanded from 66 to about 100. The list of books included have been intensivcly reviewed, and this year a definitive list of superior general reading books in science will be published and distributed to all high schools and perhaps colleges.

With the growing emphasis on original science projects in the high schools, both for their intrinsic value and for various

kinds of competitions, two valuable pamphlets might be mentioned. One is issued by Science Service for Science Clubs and Science Fair projects. The other, "If You Want to Do a Science Project," is available from the National Science Teachers Association.

Another materials project for teaching should be mentioned. Discussions are under way in various groups, notably the Educational Advisory Board of the National Academy of Sciences—National Research Council, with the Ford Foundation, for a large grant to develop teaching films for high schools and colleges. The idea would be to put regular class lectures of distinguished teachers on film for classroom or TV use. It is hoped that harrassed and poorly prepared teachers thus can be somewhat relieved in the period of expanding enrollments ahead. These efforts will probably not be restricted to the sciences.

Turning to the curricular changes affecting training and up-grading of science teachers, we find that efforts are very limited. Wayne State University and Oregon State College are among the very few institutions with special graduate programs of this kind.

Both the Science Teaching Improvement Program and the Committee on Educational Policies have devised ways of alerting science departments in colleges to take responsibility for the recruiting and training of science teachers as well as for taking an active role in developing satisfactory certification requirements and the like. The attitude that the teacher is low man on the totem pole and that the misfits who can't do research or make the grade in the professions should be the only ones advised to choose teaching as a career, must give way to a campaign to recruit capable people for teaching if science is to advance—or even survive.

The U. S. Office of Education is ready to launch a comprehensive study of the kind of training our present science teachers received before entering teaching. The Michigan Science Teachers Association and other groups have made similar local or regional studies. In several states a start has been made toward the active cooperation of science and education departments in developing better programs for teachers. A number of institutions have initiated this kind of planning on their own. The National Science Foundation is supporting, during 1956-57, with substantial funds, programs at the University of Wisconsin and Oklahoma A & M, designed to give in-service teachers a year-long experience aimed at upgrading both their knowledge of science and their ability to teach it. The teachers will be on leave from their high school positions and will receive adequate stipends.

The American Association of Colleges for Teacher Education and AAAS have a joint commission studying the science education curriculum in hopes of developing a more effective undergraduate program in both science and methodology for the training of teachers.

Many groups are attacking the certification requirements—primarily with the object of increasing the subject matter background of teachers. Ohio scientists have developed a new set of standards and have succeeded in having them adopted by the state education authorities. There are stirrings in Michigan, Texas and elsewhere. At last scientists are beginning to take some responsibility in this area and are working cooperatively with education departments.

The most spectacular changes of the last year have come in the graduate level offerings for in-service teachers. Scientists, in apparent abysmal ignorance of the backgrounds and needs of high school science teachers, long deplored the fact that science teachers took largely education courses when they came back to colleges for summer school work. These scientists failed to recognize that most high school teachers did not have the prerequisites for the highly specialized courses—often the only kind—offered by the science departments. Such courses were of relatively little value to the high school teacher. It is also true that when appropriate science courses were offered, there were few takers.

The cooperative effort of the colleges in the Washington, D. C., area, under the stimulus of the Physical Sciences Division of the National Academy—National Research Council, in setting up an entirely new set of graduate courses and finding local support for teachers to take them is only one example of a real upsurge in such offerings throughout the country.

I would like to offer for discussion the idea of developing, not only in the teachers colleges but in the liberal arts colleges and universities as well, a special curriculum for science teachers. Instead of requiring them to follow a narrow science sequence aimed at developing research work, they would take a series of new courses aimed at developing greater breadth as well as depth. The intermediate general courses in the various sciences mentioned earlier would be key offerings in such a program. Such a plan would not only lead to teachers better trained for their jobs, but would lead to recognition on the part of science departments of their responsibility in training teachers. The candidate for teaching could then become more than a neglected and despised stepchild.

Some Approaches to the Teaching Problem

OSWALD TIPPO, *Chairman, Botany Dept., Yale University; Chairman, A.I.B.S. Committee on Education and Professional Recruitment.*

MY assignment is to discuss the problem of how to attract or recruit more and better science teachers; and secondly, how to improve the quality of science teaching at both the secondary school and university levels, giving particular attention to some of the recent suggestions that have been made in this area.

First, let us consider the question of attracting and retaining a larger number of top quality teachers. The blunt, unvarnished truth is that this will require substantial increases in teachers' salaries, doubling or even tripling present stipends. If the American public genuinely wants more and better teachers, it will have to foot the bill. Society must be made to recognize that, as in all things, you get only what you pay for. If you are willing to pay respectable salaries, you will attract and retain some of the best minds. If you continue the present salary levels, you will be saddled with the misfits, the second-raters, the zombies—and perhaps a few dedicated individuals, but not enough. Professor Oscar Handlin, writing in the September 1956 *Atlantic Monthly*, describes the situation as follows: "Salary in our society is an inescapable measure of the desirability of a job. There was a time when the schoolmaster stood fairly well in the community by that standard. Few occupations now rank as low in terms of earnings as teaching. The average annual wage in elementary schools ranges from $3000 in small towns to $4800 in large cities; in high schools, from $4000 to $5500." I will spare you the customary comparison of teachers' salaries with those of janitors and garbage collectors.

Recently, the Ford Foundation gave the privately endowed colleges a shot in the arm by appropriating $210 million for salary improvement. We need similar efforts on a far more extensive scale and at all educational levels. It has been estimated that it will require $15 billion in the next decade to bring professional incomes to the level of comparable professions. You will note that this estimate is for professional salaries only; and leaves untouched the elementary and secondary schools. Beardsley Ruml, New York financier and economist, addressing a conference

of the Association for Higher Education in March 1956, urged that college faculty salaries be tripled. Under his plan professors would be paid up to $30,000 a year, with an average salary of $15,000. Let us hope Mr. Ruml will be as successful with this scheme as he was in introducing his plan to pay federal income taxes in installments. Few teachers are looking with any great glee to the prospect of swelling enrollments for the next few years. However, one of the expected by-products of the tidal wave of students will be that the law of supply and demand will force salaries to more reasonable levels. In any case, establishment of higher salaries at all school levels is an important, if not the most important answer to the problem of recruiting better and more teachers.

Equally important and inescapably linked with the salary question is the matter of status or prestige of the teacher, or more appropriately the lack of prestige. Professor Handlin, in the same *Atlantic Monthly* article cited above, has this to say about the status of the schoolmaster: "Americans have fixed the schoolmaster in a lowly status because he has fallen markedly in their estimation in the last fifty years. The lawyer, the newspaperman, and doctor are active and powerful. *Mr. District Attorney*, editor Steven Wilson of *Big Town*, and *Medic* get things done. But who can respect *Our Miss Brooks*, a female eager to be married, but unsuccessful and therefore condemned to remain in the classroom; or her male counterpart, the ineffectual, bumbling *Mr. Peepers*? Such people, incapable of the real work of the world, deserve no more than amused tolerance. 'He who can, does. He who cannot, teaches,' goes the old saw; and the nickname 'the Professor' is used with comic disparagement. The caricature is certainly out of place in a society the welfare and security of which depend upon its laboratories and its libraries. It is the product of crass materialism but it is nonetheless widely held; and it determines the American attitudes towards the profession."

Recently the local newspaper in the community in which I live carried the following article: Headline: "Board Appoints Four Teachers; Issues An Appeal For More. Four teachers were appointed by the Board of Education on Monday to begin their duties in September. The Board, through Assistant Superintendent of Education ————, issued an appeal for more teachers—particularly in mathematics and science. ———— said anyone knowing of persons qualified to teach mathematics or science could contact him. with the thanks of the School Board. Three math teachers and one science teacher are needed immediately." And then the article concluded with a listing of the names of the new teachers, together with the salaries assigned to each. Miss Blank, a graduate of Northwestern University, is to receive $3200 per year for teaching in the elementary school. Mr. Blank, who has a master's degree from Columbia University, is to be paid $3300 to teach English in the high school. This is certainly not the way to recruit teachers and to improve their status. It is a breach of good taste to publish salaries of teachers in any case, but it is downright humiliating to have such salaries appear in the public press for students and parents to read.

I am afraid that we in the colleges and universities have not done much to increase the prestige and status of our elementary and secondary school colleagues. Preoccupied with research and other matters, we have turned our backs on them. Numerous committees and organizations are now urging us to show more interest in these teachers, to become acquainted with the local science teachers, to offer them any help which we can extend to them, to visit their classes, to be ready to put on scientific demonstrations, to lecture to their classes, and to invite them to meetings of our science clubs and lectures offered by outside speakers. Invitations should be extended to them to visit our university research laboratories, as well as governmental and industrial laboratories. Invite them to join our professional societies and participate in our meetings, name them to our educational and other committees, provide laboratory materials and loan equipment, and organize teaching seminars to which elementary and secondary school teachers would be invited. Perhaps the first step in all this should be the calling of local conferences, to which would be invited high school teachers, college professors, and scientists from governmental laboratories and industry. Inform the teachers that we are interested in their problems and ask them how we can best help them.

If we are to attract some of the better minds for high school teaching, those of us in college science departments will have to modify our attitudes. All too often we have encouraged the students of high intelligence to go on to research and university teaching careers, leaving the second-rate minds to drift into high school teaching. We must encourage some of our superior students to become science teachers in the schools. We complain of the poor quality of science teaching in the high schools of the country, and yet we drain off the cream of the students for university and research positions. Science departments must accept the training of teachers as a major responsibility. Perhaps we should have national fellowships for undergraduate and graduate students who intend to become high school teachers, something along the lines of the Woodrow Wilson Fellowships. Students would not be permitted to apply for these fellowships, but instead faculty members would be invited to make nominations each year. This scheme would have the added virtue of confronting our science teachers with this problem and these opportunities each year. It would also be a recognition of the fact that we regard teaching as important.

It has been suggested we might enhance the dignity of teaching by giving annual awards to outstanding teachers. After all, we have Nobel prizes and all sorts of medals and awards for outstanding research. The medical profession has an annual award for the outstanding general practitioner. The Science Teaching Improvement Program of the AAAS is developing plans in this area. "The public recognition of exceptionally able teachers of science and mathematics represents one means of enhancing their prestige. The AAAS therefore plans to institute an annual program of awards to outstanding teachers. The teachers to be honored will be those who, over a period of years, have been recognized in their schools and communities as exceptionally effective, whose knowledge of science or mathematics approximates that of the master's degree level, and who have, through writing or other means, been of substantial help to their fellow teachers. . . . We propose to honor them with citations as Distinguished Service Teachers. Since these citations are intended not only to reward excellence but also to call public attention to the importance of good teaching, the citations will be awarded in the teachers' own schools. . . . The number selected each year should be small enough to make the citation a real honor, yet large enough to make the motivation and prestige values as widely effective as possible. Perhaps 100 Distinguished Service Teachers a year would be a good starting level. . . . For many individuals, and particularly those who are sincerely attracted by the opportunity to guide the intellectual development of young people, the respect accorded the teacher may provide the best measure of the value that society places on teaching."

Having provided teachers with adequate salaries and proper status in society, we now turn to the question of how to improve the quality of teaching in the schools and colleges of the country. If we were to ask this question of classroom and lecture room teachers, I think the answer we would get—and I am sure it would be the answer of the college teacher—is that we need *time*. We need *time* to teach, *time* to think, *time* to reflect, *time* to plan, and *time* to experiment. And yet this simple solution, so simple in conception and yet nigh on impossible of attainment, is too often lost sight of in the plethora of plans, projects, and schemes for improvement of teaching. I am sure the college professor feels that if faculty salaries are adequate and there is adequate recognition or status, all he needs additionally, is *time* to improve the quality of his teaching. To put it briefly, teachers have three basic needs—*salary*, *status*, and *time*. Once these are assured, all educational committees, commissions, and panels may be disbanded. In the absence of any one or more of these essentials, little of positive value can be accomplished.

However, let us consider some of the other suggestions for the improvement of teaching. These suggestions usually revolve about considerations of methods of teaching and subject matter. When it comes to methods, most college science teachers take a dim view of the value of education courses. Since this is such a widespread

opinion among college people, there is crying need for a scientific study designed to determine the value of such educational courses. The Joint Commission on Science Teacher Education of the AAAS and the American Association of Colleges for Teacher Education proposes to make such an investigation. Meantime it would be useful to have a summary of the certification requirements with respect to education courses in all the states of the country, and I believe that the U. S. Office of Education hopes to make such a study. The field of certification is another area which academic people have neglected, and many are urging that scientists take more active part in working with state curriculum committees and commissions, so that more soundly conceived programs may be designed.

Many claim that the requirement of educational courses is one of the serious barriers to teacher recruitment, especially among the graduates of liberal arts colleges. It has been suggested that state certification laws be liberalized by providing that the requirements may be satisfied *either* by the taking of certain education courses, or by direct examination. In any case, it would appear that the tidal wave of student enrollment, with the resulting shortage of teachers, may force considerable liberalization in the state certification requirements.

At the same time that the scientist is pointing a finger at the required education courses, the education professors and secondary school teachers are leveling sharp criticism at standard undergraduate science programs. They argue that whereas these programs may be suitable for science majors who are going on to graduate work and to research careers, they are definitely not adequate for the preparation of science teachers in elementary and secondary schools. As a result, on many university campuses, scientists and educationists have worked out joint programs. These cooperative efforts are most encouraging.

A whole group of proposals has been made which have as their object provision for in-service training. For a long time teachers have wanted special science courses offered in the late afternoon, on Saturdays, and in the summer. By means of these courses, science teachers, who have been away from college for some years, would be given an opportunity to catch up on recent developments in science. These courses would also be valuable for teachers who are prepared in areas other than science and who now hope to become science teachers. There is always considerable pressure to have these courses offer graduate credit, because so many salary schedules are linked to the amount of graduate training. In this connection, the so-called Arlington plan has attracted some attention. This is a program sponsored by the schools in Arlington County, Virginia, and is a joint effort of the Arlington Parent-Teachers organization, the Arlington Chamber of Commerce, the American Association for the Advancement of Science, the National Academy of Sciences—National Research Council, and various colleges and universities in the Washington area. Money is being collected from the citizens of the region to provide a fund (Scholars Fund for Teachers) which will be used to pay the fees of teachers who wish to take additional graduate work. If funds permit, they hope to grant stipends to the teachers while they are carrying on their studies. The universities of this region have cooperated by organizing special courses for teachers. This is the kind of community effort which bodes well for the future.

The National Science Foundation has been very active in financing summer institutes for high school and college science teachers. These are special sessions in which outstanding scientists bring high school and college teachers up to date on recent developments in science, and, further, provide stimulus and inspiration. In 1955, eleven such institutes were held, and during the past summer the number reached twenty. This program is to be vastly expanded during the summer of 1957, and I understand that there will be something like 25 summer institutes in biology. The National Science Foundation grant to the sponsoring university or agency provides honoraria for the guest lecturers, and covers fees and travel expenses of the teachers as well as stipends for these teachers. The National Science Foundation has also launched year-long programs of the same nature. During the coming academic year Oklahoma A & M and the University of Wisconsin will each offer a special program of science courses for fifty teachers. During the following year it is hoped that this program will be extended to some eight universities in the country. Again the object is to bring the science teachers up to date and to give science training to teachers of other subjects with the idea in mind of giving these persons training such as to fit them to teach science in high schools.

Another interesting project in this area—this one sponsored by the National Science Teachers Association—is the arrangement under which high school teachers are enabled to go to university laboratories and work as research assistants under the direction of university investigators. It is hoped that this scheme will eventually be extended to industrial and governmental laboratories. A high school teacher is paid a salary, thus augmenting his income, and he has the opportunity for some real research experience, the value of which should be reflected in his future teaching.

The American Physiological Society has been arranging similar programs for college teachers. It has held two summer conferences or work-shops for the teaching of physiology, and it has sponsored a scheme under which teachers from small colleges are given the opportunity to conduct research in government and other research laboratories. Since the teacher in a small college is usually burdened with a heavy teaching load and has few facilities for research, this plan offers a real opportunity for him to keep contact with research activities. The AIBS Committee on Education and Professional Recruitment has under consideration a plan to provide refresher courses for teachers in connection with the annual AIBS meetings. It is thought that perhaps teachers will be willing to stay at the meetings for an extra day or two to take advantage of lectures and demonstrations by outstanding science teachers.

The AAAS Science Teaching Improvement Program has developed a plan to provide consultants for high school science teachers: "The plan provides for the employment in each of several geographic regions of two competent science or mathematics teaching counsellors—expert consultants—who will tutor, assist and serve as a source of information and help to the less-experienced and less-competent science teachers of the region. These consultant teachers would have no administrative supervision over their colleagues, and would be employed only in regions in which supervisory help in science and mathematics is not already available within the school system."

This last item leads us to mention certain suggestions which have been made to make greater use of, or to extend the use of teaching personnel, as will be required by the swelling enrollments. They include the use of films, i.e., films of outstanding lectures and laboratory demonstrations which will then be circulated among colleges and high schools. The use of television for this and other purposes is already under way in several places. Since there has been only sporadic work on the production of television programs, there is need for a summary of the available materials.

As enrollments increase in the high schools and colleges, it is felt that we shall have to tap such sources of additional teaching personnel as married women who once were teachers, retired teachers and professors, and liberal arts graduates who have not taken education courses, but who will be given the opportunity to pick up the necessary education courses in one or more summer sessions.

It will be noted that most of these schemes and proposals are intended to improve science teaching at the secondary school level. When we turn specifically to consideration of college teaching, we find that while a large percentage of our Ph.D.'s, certainly in biology, go into college teaching, there is usually no specific training offered for teaching. Instead, the emphasis is on research training. There are those in the universities who feel that this is a perfectly satisfactory situation, since students are exposed to teaching at all levels—in the elementary schools, the high schools, the colleges, and the graduate schools. It is assumed that intelligent students will find out what they need to know about teaching in passing through the various educational levels. A widely held conviction is that you can't teach anyone how to teach, all you can do is to set a good example. At the other extreme are the few who propose that all graduate students who expect to teach in college be required to take spe-

cial education courses. Somewhat intermediate in position are such plans as that of the Oregon State College, where a graduate student may major in a given subject and minor in college teaching. Such students take three required education courses, a course in educational psychology, a course in the history of higher education, and a course on the American college. In addition, there are seminars in teaching in the subject matter departments. At Michigan State University there is a graduate program which, in addition to the orthodox training, provides for teaching opportunities under supervision as part of the graduate program.

Many science departments require that all their graduate students serve at least one year as teaching assistants. Some of these departments provide teacher training of a superior nature, although it may be quite informal. A beginning graduate student serves as a second assistant in a class under a more experienced graduate student or instructor. After a year of such preliminary training he is entrusted with his own laboratory class. During both years he attends staff meetings at which the professor in charge of the course explains the week's work and discusses teaching methods, pointing out especially effective methods. These sessions may actually be of the nature of seminars in teaching. The professor in charge of the course drops into the laboratories occasionally to observe the graduate student teacher. Later in private conference he gives the graduate student the benefit of his criticism. In addition, the graduate student has the opportunity to present papers before departmental seminars, and his presentation is criticised by his colleagues and by his professors, both publicly and privately. Eventually the graduate student may be given charge of a discussion class. In some universities the more mature graduate students are permitted to give some of the lectures and to assist in the preparation of laboratory manuals and the planning of the course. I rather suspect that most university science teachers feel that this is about the best sort of teacher training we can give our graduate students. Some universities have set up special seminar programs on teaching. A few years ago, such a program was organized and held at Radcliffe and Harvard. Subsequently, the various seminar talks were published in book form, under the title "A Handbook for College Teachers," edited by Bernice B. Cronkhite and published by the Harvard University Press (1950). Personally I think this is one of the best books on college teaching which has appeared. I would urge all young instructors to obtain a copy and read it. There are two chapters by Professor William H. Weston which are classics. In this connection, mention ought to be made of the journal "Improving College and University Teaching," a quarterly magazine, now in its fourth volume, published by the Graduate School of Oregon State College. The Cronkhite Handbook and the various issues of this Oregon journal should provide plenty of material for graduate seminars on teaching.

For those who have been unfortunate enough to slip through their graduate years without any teaching experience, the National Research Council's Committee on Educational Policies is developing a plan for post-doctoral internships. The scheme is that after a man has taken his Ph.D. he will spend one or two years at a selected university during which time he will teach under the supervision of older staff members. At the present time the Committee is planning approximately 100 internships at some ten to twelve universities.

I am sure that some of you will feel that many of these schemes and proposals are mere palliatives, a type of frantic busy work for innumerable committees—"sound and fury signifying nothing." There are many who are convinced that this whole matter of attracting teachers and improving teaching is such a complex and difficult problem that nothing less than a complete reorientation of our national culture and ideals will even come close to improving the situation. Perhaps we do a disservice to ourselves and to our profession in wasting time and energy over trivialities. Perhaps we should be hacking away at the really large issues and needs, namely drastic improvement in faculty *salaries*, the enhancement of the *status* of the teacher, and the provision of adequate *time* for the performance of the teacher's proper functions.

New Approaches to Student Recruitment and Development

HOWARD M. PHILLIPS, *Dean, Graduate School, Emory University; Chairman, Committee on Educational Policies, Biology Council, NAS-NRC.*

THERE seem to be two great problems involved today in all educational programs—in addition to a lack of proper intercommunication. These are the lack of adequate coordination of efforts and the lack of adoption of new ideas, proposals and programs, despite the soundness and logic of such programs.

There are many reasons for this state of affairs. As has already been pointed out biology has been divided and splintered into so many different specialties and categories that it is severely handicapped. Although biologists may believe in an organismal theory of behavior, we do not behave as a well organized unit. We *simply lack cohesion.*

The examination of a list of our numerous societies and organizations will support, if not prove that point. Moreover, our publications are scattered throughout at least 22,000 different journals. A recent attempt by the Committee on Educational Policies (Division of Biology and Agriculture of National Research Council—National Academy of Sciences) to bring together a bibliography of articles, conference reports and records of symposia on biological education, has resulted in the review and compilation of over 6,000 publications — and the task is not yet completed!

With these diverse interests and activities characterizing the science of biology, the recruitment and development of biologists is neither a simple nor an easy project. This is particularly true in the early stages of a student's development. There are those among us who would plead for the recruitment, especially among pre-college students, of young potential scientists generally, rather than for biologists, *per se.* There are others among us who would plead for the recruitment of biologists, even at an early age. This group would include the special interests, and the various fields which attempt to recruit only for specialists.

Any recruitment program, however, that is directed toward familiarizing the youngsters with possible career opportunities in biology, should first introduce them to the fascinating and challenging experiences available in biological studies and in biological research. If this approach were accepted, there probably would be adequate support for both schools of thought.

Admittedly in America, we have not done an adequate job of recruiting and developing young scientists in any area of study. The country is gradually awakening to the need, as evidenced by numerous newspaper and magazine articles, but a comparison of our situation with that of Russia was required before the scientific world or the general public gave some evi-

dence of alarm. It is encouraging now to note the activities and programs that have been inaugurated by various scientific societies and organizations on the state, regional and national levels.

Throughout this entire education dilemma, however, one common denominator pervades all aspects of the problem—the teacher. The teacher is really the crux of all recruitment and development programs. Something must be done, therefore, to both improve the present teacher and the teacher situations, and to make the teaching positions of the future much more attractive. Our teachers must become, if success is to be attained, enthusiastic recruiters.

What is the real situation in biology?

It should be pointed out first, perhaps, (even with the omission of statistics) that the report of Philip Johnson in 1952 revealed that school enrollments in biology had more than kept pace with the general increase in school enrollments during the period from 1947-52. A study by Kenneth Brown in 1956, showed an annual decrease from 74.8% in 1952 to 72.6% in 1954. There is a general impression among biologists that the decline since 1954 has been even greater.

Without any attempt to belabor the obvious, it should be re-emphasized that biology is lagging behind physics, chemistry, mathematics, and engineering with regard to recruitment programs. A booklet, "Career Opportunities in Biology" prepared in 1955 by Dr. Russell Stevens of the Biology Council (Division of Biology and Agriculture, NRC - NAS) was the first general attempt at recruitment for the biological sciences. Several biological societies have had, for a number of years, committees on education and recruitment, but until recently programs have not been properly coordinated. Numerous special pamphlets have been prepared by these groups, including among others,

(1) "Your Opportunities in Plant Pathology"; Comm. on Vocational Guidance in Plant Pathology (American Phytopathological Society).

(2) "Molds, Mycology and You."

(3) "A Career in Bacteriology"; Society of American Bacteriologists.

(4) "Opportunities in Progressional Entomology"; Entomological Society of America.

(5) "Opportunities in Horticulture"; Iowa State College Bulletin.

(6) "You Help to Make a Better World Through Your Career in Agronomy"; American Society of Agronomy.

(7) "Find Your Career in the Poultry Industry";—Comm. on Poultry Careers, Poultry Science Association.

(8) "Food Engineering, A Career With a Future"; Food Engineering Council.

I think it should be noted in passing, that with the current emphasis being placed in teacher recruitment, there is danger of de-emphasizing other career opportunities in the biological sciences. Certainly the teaching shortages at all levels cannot be over-emphasized, but we must not *ignore other careers in biology*. Dr. Stevens, in his booklet, discusses, in addition to careers in teaching, those of the investigators, the technicians, the artists, writers, librarians, the clerical assistants, the businessmen, the agriculturists, the civil servants, the explorers and collectors, the ambassadors, the amateurs and hobbyists.

One of the greatest difficulties involved in recruitment, is the fact that it is a many faceted problem. A multidimensional and multipronged attack is, therefore, necessary. This means that assignments must be divided and that many task forces must be organized. However, when attempts are made to use this approach, and when a single program is devised to grapple with one facet of the problem, one is immediately deluged with letters of criticism suggesting that there are other aspects of the problem much more important. That is why some central agencies must be charged with the responsibility of bringing the separate programs into sharper focus. And yet, we can certainly multiply our difficulties if we assign this task to too many central agencies.

The National Science Foundation has played an important and significant role in the recruitment and development of scientists in America. Through its various programs of grants-in-aid, it has subsidized directly and indirectly many programs. All of you are familiar with the pre-doctoral and post-doctoral NSF Fellowships ($2 million per year), individual grants-in-aid, summer institutes and conferences, and special symposia. In addition the Foundation helps to support the Science Clubs of America (Science Service), a visiting lecturers program (conducted for Biology by AIBS) a traveling libraries program (AAAS), a traveling science demonstration program (ORINS), and a study by the Educational Testing Service to determine the vocational aims and attitudes of 1955 high school seniors. Of perhaps equal importance is the Foundation's support of three conferences which have brought together key representatives of the various scientific societies and committees, concerned with educational problems. All of these activities involved either directly or indirectly the recruitment and development of students.

Another outstanding project is the Science Teacher Improvement Program of the AAAS. Reference has already been made to the traveling libraries. The AAAS assumed responsibility for the preparation and distribution of an "Interagency News Letter" based on the conferences, already referred to, sponsored by NSF and AAAS. These conferences represent a major and significant step in the proper direction of intercommunication and integration. Seventeen different national societies, including agencies and committees, have been represented at these conferences. In addition the AAAS in actively attempting to encourage Junior Academies to broaden their programs and activities.

During 1956 the National Academy of Sciences and the National Research Council have jointly created an Educational Advisory Board. The Board has one representative from each of the several divisions within NRC, including the division of Biology and Agriculture. The major objectives of the Board have been defined and they include objectives concerned with proper recruitment and development of students.

The Biology Council of the Division of Biology and Agriculture (NRC-NAS), two years ago inaugurated a comprehensive program concerned with problems in biology in general. Several positive programs have been inaugurated by the Council, reports on which have either been published or will be published in the near future. The Committee on Educational Policies, a unit of the Biology Council has been discussed by both John Behnke and Oswald Tippo. The Committee is primarily concerned with the (1) improvement of the teachers, present and future, and in their positions, (2) in the recruitment and development of students in biology, and (3) with the problem in education that confronts all biologists. Several subcommittees, including one on recruitment, have been organized.

The Federation of American Societies for Experimental Biology is conducting an outstanding program in education. Directly associated with recruitment and development are the career pamphlets, "Careers in Physiology," "Opportunitites in Biochemistry," "Opportunities in Pharmacology." Further mention of Federation activities has been made by my colleagues.

The American Institute of Biological Sciences has created a Committee on Education and Professional Recruitment. The Committee held its organizational meeting in New York on January 12-13, 1956. Most of the proposals at this meeting were concerned with teacher education, more adequate dissemination of information, career guidance material, reviews and survey articles that would aid in recruitment.

The Future Scientists of America Foundation, in conducting its 1956 program, has approved (1) the distribution of 50,000 copies of the booklet "Careers in Science Teaching" with NSTA (2) publication of a new eight page monthly booklet, "Tomorrow's Scientists" (3) Compilation of a 1956-57 bibliography on Career Counselling Materials and Services (40,000 copies) (4) Continuation of Science achievement awards for students (5) Fellowships for Summer Conferences.

The National Association of Biology Teachers has held two conferences on Biology Teaching, the Southeastern in 1954 and the North Central in 1955. Reports of these conferences appeared in two issues of the AMERICAN BIOLOGY TEACHER. Aids to recruitment were vital issues in these conferences. The Association has cooperated with AIBS, NRC and AAAS, in all of their programs on recruitment and development.

Most biologists are familiar with the modern approaches to recruitment and development of the (1) Westinghouse

Science Talent Awards, (2) General Electric and other industrial organizations' student and teacher fellowships and the (3) Science Fairs sponsored by Science Service, state academies, local and regional organizations. All of these are important contributions.

The education committees of many societies, including those in physics, chemistry, the earth sciences, and mathematics, have made worthy contributions to the cause. The activities of the Education Committee of the Botanical Society of America, to cite one example, illustrates the excellent work of this group. From this Committee have emerged new, provocative, and sound ideas on education and recruitment. Recently, the Committee has been sincerely concerned with determining botany's role in biology—a decision that could vitally effect recruitment.

I would now like to be presumptuous, and outline what I consider to be the better approaches to recruitment and development. These suggestions will represent a composite of ideas emerging from many organizations, particularly the Committee on Educational Policies, with the addition of some personal view points. These are the suggestions:

1. There should be a greater distribution and use of all types of career guidance materials, including films. These should be provocative, imaginative, and challenging and include information on all types of careers.

2. We should be sure that biology is adequately, correctly, and equitably presented by counsellors and career guidance personnel.

3. We should use all appropriate means and methods to identify as early as possible the *especially gifted students*. Two decades of secondary school emphasis on life-adjustment education geared to the abilities, interests and needs of all youth have made the talented youngster the step child of American education. We must provide the precollege student with general information on opportunities, academic and otherwise, for development in biology with insistence on their exercising the privilege of choice of fields.

4. College and university biologists should establish better liaison between themselves and primary and secondary school teachers. Cooperative programs would enable better follow-ups on the especially gifted student.

5. Positive educational programs with regard to the early recruitment of potential sciencists should be inaugurated by the faculties of all colleges. Special projects should be designed for the first-year college students.

6. Colleges, biological institutes and biological stations should provide summer assistantships, apprenticeships and short vacation institutes for the exceptional students. The CEP has already spear-headed a program of this type.

7. At the sophomore level in college, arrangements should be made to assign the carefully screened and selected students to carefully screened and selected faculty members. An honorary apprenticeship or assistantship program with some small stipend for the students could be inaugurated at this level. Apprenticeship assignments should be light; the primary objective should be the creation of a good relationship between student and professor that would allow the student to become more familiar with the fascinating aspects of biology and with the good life of biologists.

8. A junior-level assistantship program that would include special divisional or departmental seminars should be devised. The attractive features of careers in biology could be discussed by students and professors in the seminars in addition to research and subject matter discussions.

9. At the close of the sophomore year, scholarships for special "research" projects could be assigned to juniors.

10. During the senior year, the students would receive varying types of assistantships. Graduate fellowships and assistantship appointments could be made at the end of the junior year with the specific stipulation that scholastic averages, interests in the field of study, etc., would have to be maintained throughout the senior year.

In addition to the many advantages of this proposed program, curricular requirements for these students could be reduced and stream-lined.

Admittedly, the program suggested would have to be geared in with a program that would induce students to enter careers in biology as technicians, and various types of specialists. The need for these individuals is also great. Adjustment in programs and compromises in schedules would have to be made by faculties. Experience has demonstrated that many aspects of this type of program can be successfully administered. These suggestions presume, of course, new and feasible approaches to the curricula and new approaches to the teaching problem, for all students in biology. Most important, a selling job must be done in order to persuade and interest faculties and administrations.

The Summer School of Biology at the Peabody Academy of Science, 1876-1881

RALPH W. DEXTER[1], *Kent State University, Kent, Ohio*

EARLY in 1876 Alpheus S. Packard, Jr., Director of the Peabody Academy of Science at Salem, Massachusetts, proposed to the Board of Trustees that a Summer School of Biology be established. This would be modeled after the Anderson School of Natural History organized by Louis Agassiz on Penikese Island, at which Dr. Packard had been an instructor during the two years of its brief existence (1873-74). With approval for this project secured, a small laboratory (20 x 30 ft.) was constructed in the back yard of the museum building (Figs. 1 and 2) and a lecture room was created in East India Marine Hall (for a view of this building at about this date see the Amer. Nat. 90: 215, 1956).

The *Salem Register* for February 14, 1876, made the following announcement which summarizes the plan of organization and arrangements of operation. "A Summer School of Biology will be opened in the Museum of the Peabody Academy of Science, Salem, Mass., beginning July 7, and continuing six weeks. Especial attention will be given to marine botany and zoology, as the advantages of dredging and shore collecting are most excellent. The museum of the academy is situated within less than five minutes walk of the wharves, while the cars and omnibus run often to the beaches and good collecting grounds. The number of students will be limited to fifteen, and while the school is designed primarily for the teachers of Essex County, Mass., a few others can be admitted. Board can be obtained for $5 a week and upwards.

Instruction in Botany will be given by Mr. John Robinson, with the assistance of Mr. Chas. H. Higbee, and in Zoology by A. S. Packard, Jr., with the assistance of

[1] The writer is indebted to Ernest Stanley Dodge, present director of the Peabody Museum of Salem, for his permission to make this study and for his cooperation in locating historical documents.

Exterior view of the laboratory built for the first Peabody Summer School of Biology.

Messrs. J. S. Kingsley and S. E. Cassino. Mr. C. Cooke will have charge of the dredging parties. Special instruction will be given in Microscopy by Rev. E. C. Bolles. Prof. E. S. Morse and several other naturalists will probably give an occasional lecture. An admission fee of $10 will be charged."

Dr. Packard became director of the new Summer School. In addition to those mentioned above, T. Lyman Perkins taught physiology and Dr. A. H. Johnson lectured on the human nervous system. Plant specimens were obtained from the private greenhouse of John Robinson.

The school opened with a full enrollment. Prof. Morse, introduced by Packard as the first lecturer, stressed the point that, "Here nature may be studied at first hand." The first topic of study was the common clam. The *Salem Gazette* reported (July 11, 1876) that, "The lecture was not only instructive but interesting, presenting the subject in a very simple and pleasing manner."

The school met with immediate success, filling a vital need among science teachers of the day. The *Observer* for August, 1876, explained that, "The advantages which Salem affords for such a school are apparent. With a valuable museum always open to students for consultation, situated on the sea-coast where the collection of various forms of marine life may be effected at little or no cost, and having among its permanent residents quite a number of scientists who possess all the necessary qualifications for instructing in such a school—it appeared at the outset that in such a place the experiment stood a fair chance of success. But the moderate expectation of the projectors of the enterprise have been more than realized. More than the number of pupils advertised for have been obtained (one from Michigan and one from Vermont as well as those from Mass.) while quite a number of our citizens who are specially interested in scientific matters have attended the forenoon lectures at the Peabody Academy of Science."

Collecting of specimens was carried out on nearby shorelines and a sailboat was employed for dredging. Dissections were made in the laboratory and drawings prepared from such studies. Compound microscopes were available for student use. The instructors received no fees; staff members at the Academy (Packard, Morse, Robinson, Kingsley, Emerton, Scars and Cooke) taught as part of their regular duties, and others volunteered their services.

The second session opened on July 6, 1877, and ran for six weeks. Special attention was given to insects (A. S. Packard), spiders (J. H. Emerton), and crustaceans (J. S. Kingsley). Veterbrate anatomy (R. R. Wright) was also introduced. A lecture was given at 9 A.M. every Monday, Tuesday, Thursday, and Friday. New lecturers included Charles S. Minot, who taught histology, and A. B. Hervey who lectured on marine algae. Wednesdays were devoted to dredging trips; afternoons were given to laboratory work. That year Spencer F. Baird established headquarters for the U. S. Fish Commission at Salem and offered dredging facilities to members of the school. Twenty-one students were enrolled and ten others attended the lectures. The students came from Maine to Japan; from Virginia to Louisiana. Colleges represented included Vassar, Wellesley, Cornell, and Williams. In Packard's opening address he stressed that, "Biology as well as geology is a science of observation. The facts concerning the morphology, mode of growth, and mutual relations of organisms must be learned by handling, observing, and drawing the objects themselves—We shall endeavor to study nature at first hand, and the scalpel, the pencil, and microscope will be the instruments of research.—The idea I would impress upon you is to spend the bulk of your time in the thorough study of a few typical forms of life, dissect and draw, learning how to observe; and when you have learned to observe for yourselves, it will be easy to teach others."

Praise for this new department of the Academy was accorded in *Harper's Weekly* for April 13, 1878. In part it read, "Of the various schools projected since the establishment of that at Penikese by Prof. Agassiz, the original of many followings, that of the Peabody Academy is the only

Interior view showing one of the classes at work.

one that has been maintained for several years in succession and with increasing efficiency. This is due largely to the residence at Salem or its vicinity of a body of specialists in natural science, and to the facilities of the locality for securing the necessary opportunities and material of research."

In the third session, which began on July 5, 1878, J. S. Kingsley was placed in charge of the laboratory and he gave instruction in zoological drawing. The fee for those outside of Essex County was raised to $20.00. The instructors were Packard, Kingsley, Bolles, Minot and Emerton. Only 13 students attended that year. An added feature was the establishment of a second laboratory named the "Salem Marine Zoological Laboratory" on Salem Neck, operated by J. H. Emerton and C. S. Minot. This was in session for a longer period of time, from June 1 to October 1. The rate was $20.00 a month or $1.00 a day.

The following year J. H. Emerton gave instruction at a temporary laboratory located at Salem Willows to the five students registered that season. Packard had left Salem to take up new duties at Brown University. E. S. Morse, recently returned from Japan, was appointed his successor as director of the Peabody Academy, and in the summer of 1880 directed the Summer School. Morse also had taught at Penikese under Agassiz during the first session of that school, and had lectured during the first session of the Salem school. Other instructors in the fifth season were John Robinson (cryptogamic botany), John H. Sears (plant taxonomy), Charles Fish from Bowdoin College (insects), G. L. Goodale from Harvard University (plant physiology), J. W. Fewkes from the Museum of Comparative Zoology (invertebrate zoology), H. H. Staight from Oswego Normal School (vertebrate zoology), and G. M. Sternberg (anatomy and bacteriology). Fourteen regular students and eight who attended lectures composed the group.

In the sixth and last session the Summer School was reduced to a four week term. Morse announced his two-fold objectives as follows: "first, to present methods of teaching from actual specimens; second, to give some idea of the methods of original investigation." D. P. Penhallow replaced Dr. Goodale to teach plant physiology; Morse took over part of the invertebrate zoology; Sears, Fish, Fewkes, and Staight continued; and C. S. Minot returned to teach embryology. Only six regular students and five auditors were registered.

Plans for another four week session were made for the summer of 1882. E. S. Morse was making arrangements to return to Japan so directorship at the school was turned over to John Robinson. C. E. Bessey, of Ames, Iowa, was engaged to teach plant physiology and A. H. Tuttle of Columbus, Ohio, to teach vertebrate anatomy and physiology. However, since only three students made reservations by July 1, the school was discontinued. The announcement was made that, "The discontinuance of the Summer School is the fate of nearly every such institution in the country, ours having survived for longer than most of the others."

Thus ended one of the early attempts to operate a summer biological station. At about this same time, Alpheus Hyatt, a colleague of Packard and Morse, organized a private summer school at his summer home in Annisquam. This, too, operated for six summers and suffered a similar fate with declining attendance. However, Dr. Hyatt was successful in transplanting this station to Woods Hole where he reorganized under more favorable circumstance and founded the Marine Biological Laboratory which has become one of the world's leaders in its field (Dexter, R. W. Sci. Month. 74: 112-116. 1952).

University of Delaware Marine Laboratories

CARL N. SHUSTER, JR., *Director*

ESTABLISHED in 1951 by legislative action resulting from the cooperation of a small but dedicated group of citizens and university officials, the University of Delaware Marine Laboratories, a part of the Department of Biological Sciences, now have major facilities at two centers. A Marine Biology Laboratory is on the university campus at Newark. Here the office of the laboratories' director, the reprint library, class room and research facilities are organized to carry out laboratory research and the academic program of the department.

On a narrow strip of marshland topped by scattered sand dunes and abounded by Delaware Bay, Roosevelt Inlet and the Broadkill Creek stands the modest unit of a field station, the Bayside Laboratory. This unit, the M. Haswell Pierce Building, named in tribute to the man who sparked the interest in marine biology in Delaware, was dedicated on June 9, 1956. The Bayside Laboratory is located on property of the Town of Lewes, an historic community now celebrating its 325th anniversary. At this town, just inside Cape Henlopen, more tons of fish, principally menhaden, are landed annually than at any other port in the nation.

The entire eastern boundary of the State of Delaware lies in water. Piedmont, coastal plain, freshwater, estuarine, and marine habitats exist within a few miles of each other. This provides an excellent opportunity to study and compare the ecology of several aquatic habitats.

The program of the Marine Laboratories is based upon fundamental research. Although the principal activity at present is the study of the estuarine environment and estuarine productivity, the horizon of interest has been kept broad purposely. The intent is to obtain ultimately an understanding of the coastal area of Delaware and the biota it supports.

Three research programs are conducted at the Bayside Laboratory — vertebrate zoology, invertebrate zoology, and hydrography. The program in vertebrate zoology, directed by Dr. Franklin C. Daiber, is at present concentrated on fisheries problems. These studies are supported in part by the Delaware Board of Game and Fish Commissioners. Studies on the life history of the gray squeteaque, and the comparative life histories of two species of skates found in Delaware Bay are being conducted.

Projects to examine the diet of certain fishes, digestive mechanisms in fish, and the utilization of food by fish will help lead to an understanding of estuarine community metabolism. Interspecific relations between intrageneric species found in Delaware Bay are being studied.

Intriguing problems on survival and growth of the bluecrab in low salinity waters, seasonal distribution of mysids in the inlet of an estuary, and comparative aspects of the gross shell structure of certain bivalve molluscs, as well as continued observations on the oyster and the natural history of the horseshoe "crab" are receiving the attention of Dr. Carl N. Shuster, Jr., and his students. Since 1951 a comprehensive ecological survey of the invertebrate fauna of the Delaware estuary has been conducted by William H. Amos during the summer months. When completed, with the organisms fully identified, this inventory will be valuable in special problems on the biology of local estuarine species. A study on the ecology of fouling organisms has already developed from the survey.

At present the hydrographic program is chiefly a service one, aiding the field studies of other programs. A seasonal hydrographic survey from the Atlantic Ocean to Philadelphia, begun in 1951, is now run con-

jointly with the New Jersey Oyster Research Laboratory as one of a series of continuing projects. Seasonal changes in the hydrography of smaller estuaries are also being studied.

In the past, under the former director, Dr. L. Eugene Cronin, research has been conducted on the zooplankton crop of the Delaware River estuary, on the blue crab, and on several species of mud crabs. A four-year sport fishing survey and a report on the trawl fishery have been completed.

The summer research program is carried on by a staff of some seventeen persons at the Bayside Laboratory. Limited space is available for visiting investigators.

The educational activities of the staff receive their inspiration from the research program and are twofold: university and universal education. At present four courses are offered in the Department of Biological Sciences at the senior-graduate course level: marine biology, marine invertebrates, ichthyology, and fish ecology. Marine conservation is discussed and is illustrated by field trips in a summer conservation workshop for teachers. There are three graduate fellowships in marine biology, with a fourth to begin in 1957. Both M.S. and Ph.D. degrees are conferred in biological sciences. Emphasis in the master's programs is on the natural history of aquatic organisms and is chiefly discriptive, while the doctorate research, utilizing the experimental approach, is directed toward the extension of life history studies into physiological, biochemical and other aspects. The broad natural history base serves to give the student greater perspective and impetus in the experimental studies, which are concerned with explaining natural phenomena.

Universal education consists of *Biennial Reports*, the *Estuarine Bulletin*, exhibits and lectures. The *Bulletin* has proven popular with student and faculty contributors as well as the reading public. Some 3,000 copies are distributed bi-monthly. The first collection of reprints is being readied for distribution late in 1957.

Bayside Laboratory, University of Delaware Marine Laboratories, Lewes, Del.

Marine science in Delaware is not restricted to the Marine Laboratories. Among several departments of the university the study of marine organisms and subjects is widespread. Research includes the following studies: the chemistry of fish oils by Dr. William A. Mosher and associates; the physical and chemical nature of the mucus secreted by *Busycon* by Dr. Harold Kwart; the physiology and biochemistry of the gill tissue, mucus and mucous epithelial cells of molluscs, and ciliary activity by Dr. Raphael R. Ronkin; the effect of wildlife habitat improvement on mosquito production and the effects of toxicants upon tidal marsh organisms by Dr. Louis A. Stearns, Dr. Richard F. Darsie and associates; the ecology of intertidal and littoral insects by Dr. Robert S. Howard; marine fossils, bottom sediments in estuaries; and aquifer recharge by Dr. Johan J. Groot and associates; pollution abatement by Dr. Vaughn C. Behn; the relationships between rainfall and runoff, and beach erosion and littoral drift processes by Vohnnie J. Pearson; the maritime history of Delaware by Dr. David B. Tyler; and the art of knotting and splicing by Dr. Cyrus L. Day.

Continued support of the marine research and education program is assured through the interest of the university administration and citizens of Delaware.

1957 A.I.B.S. MEETING

will be held at

STANFORD UNIVERSITY

California

August 25-29

Within the next two months, members of societies planning to meet under A.I.B.S. auspices at Stanford will receive a call for papers from their appropriate society officer. The General Program, printed by A.I.B.S., will appear one month in advance of the meetings and will be mailed to members of participating Member Societies. Advanced registration and housing forms for Stanford will be found in the next two (April and July) issues of the *Bulletin*.

Plan now to visit Stanford and the West Coast.

THE ORIGINAL SCIENCE FICTION STORIES
Astounding SCIENCE FICTION
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Galaxy SCIENCE FICTION
AUGUST 1956
THE CLAUSTROPHILE by Theodore Sturgeon
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THE DEMOTION OF PLUTO by Willy Ley
SCIENCE FICTION
if WORLDS OF SCIENCE FICTION
AN EXPLOSIVE STORY OF DANGER IN A PEACETIME ATOMICS PLANT
The Man Who Upset the Universe

The By-Product of Science Fiction

In the battle against the cult of ignorance a branch of popular literature holds out for the respectability of brains

ISAAC ASIMOV, *Boston University School of Medicine*

ON JUNE 25, 1956, I watched Producer's Showcase on television and witnessed, in striking form, the conflict between the Need for Education and the Cult of Ignorance.

The Need for Education was brought home with the very first commercial, which pulled no punches. The sponsor, it seemed, needed missile engineers and he set about luring such engineers to his Florida factory. He stressed the climate and the beaches, the good working conditions, the cheap and excellent housing, the munificent pay, the rapid advancement, the solid security. He did not even require experience. The effect was such that I, myself, felt the impulse to run, not walk, to the nearest airport and board a plane for Florida.

Having overcome that impulse, and having brooded for half a moment on the shortage of engineers and technical men brought on by the ever-intensifying technological character of our civilization, I prepared to enjoy the play being presented, which was an adaptation of "Happy Birthday" by Anito Loos, starring Betty Field and Barry Nelson. I *did* enjoy it; it was an excellent play;—but, behold, the sponsor, who a moment before was on his knees, pleading for technically trained men, paid to have the following presented to his audience of millions.

Barry Nelson is a bank clerk who spends much of his free time in a bar because that is where one meets women (as he explains). The one setting is the bar itself and the cast of characters is a wonderfully picaresque group of disreputables with hearts of tarnished gold. Barry Nelson, in the course of the play, explains that he doesn't read books (he is talking to a librarian) although, he admits with seeming embarrassment, he once did. He explains that his father once paid him a sum of money to learn to recite the Books of the Minor Prophets of the Bible and to show he can still do it, he rattles them off, explaining that when he was younger he could recite them much more quickly. Thus, the audience is presented with an example of what book learning is, and it is clear to them that this sort of thing is useless and ridiculous and that Barry is wise to eschew books and confine himself to bars.

The American Stereotype

Betty Field, on the other hand, is a librarian; that is, an educated girl, since she implies, now and then, that she has read books. She is shy, corroded with unhappiness, and, of course, unnoticed by boys. In the play, she violates the teetotalling habits of a lifetime and takes a drink, then another, the another. . . . Slowly, she is stripped of her inhibitions. The stigma of intelligence is removed, layer by layer, as she descends into a rococo alcoholism. The result is that the barflies, who earlier viewed her with deep suspicion, end by making a heroine of her; her alcoholic father, who beat her earlier, takes her to heart; and, best of all, the bank clerk, who had never noticed her earlier, makes violent love to her.

I repeat, I enjoyed it thoroughly. And yet, viewed in the sober gray light of the morning hangover after, the play preached a great American stereotype: that only in ignorance can happiness be found; that education is stuffy and leads to missing much of the happiness of life.

Is there some connection between this and the fact that the sponsor is having trouble finding technically trained men? Yes, we need technicians. Society as a whole needs them or it will collapse under the weight of its own machines. But how are we trying to get them?

Is it sufficient for an industrial concern to lure missile engineers? What it amounts to is that engineers are being lured from one specialty into another, with the total number seriously short. If a community can get rich by taking in one another's washing, this sort of thing can work, but otherwise, not.

The Solutions Fall Short

Other solutions have been suggested. Men advise that science teachers be paid more, that bright students be given scholarships, that industrial chemists and engineers devote time to teaching and so on. All these points are valuable, but do any of them go far enough? And if you did, somehow, get a sufficiency of wonderfully expert science teachers, whom would they teach? A group of students, most of whom have been indoctrinated from childhood on with a thoroughgoing belief in the limitations of educated people and the worthiness of natural ignorance.

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Think for yourself of the literary stereotypes of the "bad boy"—the best of whom were Tom Sawyer and Penrod Schofield (and a more modern example of whom is Henry Aldrich). School is their enemy; schoolteachers hateful; book learning a bore and delusion. And who are the villains of the piece? The Sid Sawyers and Georgie Bassetts — little sneaks who wear clean clothes, speak correct English, and like school (loathesome creatures).

I have never stolen an apple from a neighbor's apple tree or rifled a watermelon from his watermelon patch (there being little or no opportunity to do so in the depths of Brooklyn) but I thoroughly detested the villainous teacher's pets who wouldn't engage in such lovable and manly little pranks, or who wouldn't play hookey and lie about it, or participate in a hundred and one other delightful bits of what we today call juvenile delinquency.

Plight of the Intellectual

Perhaps it is our pioneer background, when school seemed merely a device to take a boy from his necessary chores and put him to work learning Latin verb declensions, to the thorough exasperation of his overworked father. Whatever it was, many of us can remember the scorn heaped by the newspapers on the "fuzzy-minded professors" of the Brain Trust of early New Deal days. And more recently, there are those who seriously suggest that one of the factors in Stevenson's smashing defeat of 1952 was that, in his public speeches, he was so incautious as to reveal unmistakable signs of intelligence.

Have you ever noticed the role played by spectacles in movies and television? Glasses in the popular visual arts of today are the symbol of developed intellect (presumably because of the belief on the part of the average man that educated men ruin their eyes through over-indulgence in the pernicious and unhealthy habit of reading). Ordinarily, the hero and heroine of a movie or television play do not wear glasses. Occasionally, though, the hero is an architect or a chemist and must wear glasses to prove he has gone to college. In this case, he is constantly whipping them off at every forceful speech he makes. True, he puts them on to read a piece of print, but then off they shoot again, as he bunches his jaw muscles and assumes the more popular role of unpedantic valor.

An even better example is a Hollywood cliche that has been so efficiently ground to dust by over-use that even Hollywood dare not use it again (an almost incredible state of affairs). The cliche to which I refer is the one whereby it is assumed that Betty Grable, with glasses on, is ugly.

This has happened over and over again. Betty Grable (or Marilyn Monroe or Jane Russell) is a librarian or a schoolteacher (the two feminine occupations that, by Hollywood convention, guarantee spinsterhood and unhappiness) and naturally she wears big, tortoise-shell glasses (the most intellectual type) to indicate the fact.

Now to any functional male in the audience, the sight of Betty Grable, or similar female, in glasses evokes a reaction in no way different from the sight of her without glasses. Yet to the distorted view of the actor playing the hero of the film, Betty-Grable-in-glasses is plain. At some point in the picture, a kindly female friend of Betty Grable, who knows the facts of life, removes Betty's glasses. It turns out, suddenly, that she can see perfectly well without them, and our hero falls violently in love with the now beautiful Betty and there is a perfectly glorious finale.

Is there a person alive so obtuse as not to see that (a) the presence of glasses in no way ruined Betty's looks and that our hero must be perfectly aware of that, and (b) that if Betty were wearing glasses for any sensible reason, removing them would cause her to kiss the wrong male since she probably would be unable to tell one face from another without them?

No, the glasses are not literally glasses. They are merely a symbol, a symbol of intelligence. The audience is taught two things: (a) Evidence of extensive education is a social hindrance and causes unhappiness; (b) Formal education is unnecessary, can be minimized at will, and the resulting limited intellectual development leads to happiness.

Stereotype vs. Education

It is this stereotype of good human ignorance versus dry, unworldly education that we must somehow fight and conquer if we are ever to get sufficient quantity of raw material—that is, children who are brought up to respect and admire intelligence—upon which to apply the palliatives we suggest (money, security, prestige) to increase our supply of scientists and technicians.

The battle is not entirely one-sided, of course. The *$64,000 Question* has taught us that under rare conditions it is profitable to know a good deal about Shakespeare. The Tomorrowland programs put out by Disney and the Mr. Wizard shows are examples of what television can do. Worthwhile books appear even in paperbacks, side by side with the most unlikely companions.

What seems most important to me, however, is that there is one entire branch of popular literature which is largely given over to the proposition that brains are respectable. That branch is known as science fiction.

A Respect for Brains

Those who are not acquainted with the field must immediately be informed that it has many branches and aspects. Of these, the least advanced are, alas, the best known. The rash of science fiction movies that deal with papier-mache monsters and young men and women who display their scientific proclivities by whipping glasses on and off are nothing much, but even here is some attempt to value intelligence. The scientist stands (however Hollywoodishly jut-jawed) between the terrors of papier-mache and the cowering peoples of Earth. He is not, as in most non-science-fiction movies that feature him, merely a humorous figure who speaks in long words and betrays a comic and nearsighted innocence when confronted with the statistics of the baseball season. Much the same can be said even for the comic magazine version of science fiction.

Science fiction at its worthiest and most intelligent, however, is found in the magazines devoted to the genre. The science fiction published by these magazines deals, in varying degrees of literary excellence and scientific accuracy (both, on occasion, astonishingly high), with life in societies more technologically advanced than our own.

Naturally, a science fiction story can be entirely frivolous, as for instance would be the case of a story dealing with a man who invents a device whereby he may unobtrusively see through walls and clothing. It should be obvious that, properly handled, a great deal of enjoyable ribaldry may result, but nothing much beyond that. A science fiction story can even be antiscience, as were a great many, several years ago, which described atom-shattered Earths with scattered and primitive survivors, all yielding the pretty obvious moral that all this would not have happened if only men had avoided poking their nose into science and had stayed close to the simple things of life.

But a significant fraction of science fiction stories have as their chief motivating force some kind of technical problem, and as their chief characters, technically trained people.

I can cite some examples. One deals with a party of scientists who travel to a distant planet to find the reason for the mass-death of an earlier colonizing party despite the planet's apparently ideal nature as a home for man. The answer turns out to be that the planet's crust is high in beryllium compounds and death is the result of insidious beryllium poisoning.

The second story deals with the efforts of a historian to gain permission to use the government's "time-viewing" machine in order to gain data on ancient Carthage. On the government's refusal, he engages the services of a physicist to build him such a machine, — with totally unexpected and tragic results.

In the first story, there is a consideration of the problem of the expanding quantity of scientific data and the increasing realization of the inability of the human mind to cope with even a fraction of it. In the second, there is a description of what might take place in a society where government grants become the sole financial support of research.

The By-Product

This sort of thing is, as you see, a step above "The Monster from Twenty Thousand Fathoms."

But both the story itself and the sociological background are, in a way, less im-

portant than the mere fact that although the individual scientist in such stories may be hero or villain (depending on whether he is intelligent and reader-sympathetic or intelligent and reader-unsympathetic), science and intelligence, themselves, as abstract forces, are represented sympathetically. Scientific research is presented, almost invariably, as an exciting and thrilling process; its usual ends as both good in themselves and good for mankind; its heroes as intelligent people to be admired and respected.

Naturally, science fiction writers do not deliberately go about doing this. If they did it deliberately, the chances are that their stories would play second fiddle to their propaganda and prove quite unpublishable; or if published, quite boring, and thus do more harm than good.

It merely happens that this sort of thing comes about almost unwittingly. However much a science fiction writer may think primarily of writing a good story and secondarily of making an honest living, he inevitably finds that every so often he cannot escape making intelligence, education, even a scientific career, attractive. *That* is the by-product of science fiction.

Means for Recruiting

It is false snobbery, then, to affect to despise science fiction and to cite as excuse the more childish versions of it produced by Hollywood and the comic magazines. It may not appeal to the individual scientist as personal reading matter, but to ignore or revile it for that reason, is to ignore or revile an ally in that sector of the field where our enemy, the cult of ignorance, is strongest.

I can only wish that even more technologically trained people were interested in science fiction and that even more tried to write it, if only to raise the quality of the field and make it still more efficient as one means of recruiting future scientists. The armed forces frequently interest themselves in motion pictures dealing with the services in order that technical details be correctly presented and that military traditions not be made to appear ridiculous. It seems not too unreasonable to hope that some day scientists as a group will be interested in having themselves presented with reasonable accuracy. Why not see to it that the alchemical retort is removed from the movie version of the chemistry laboratory and that the notion be discouraged that a nuclear physicist prepares a new type of atomic bomb by mixing water and dry ice in a test tube and staring earnestly at the mysterious smoky bubbles that result?

A specific example of what I am trying to prove is illustrated by a letter from Steven R. Miller of Flushing, N. Y., to John W. Campbell, Jr., editor of *Astounding Science Fiction* (which, of all the science fiction magazines, is the most technical in content). The letter read, in part:

"I feel I owe you and '*Astounding*' a great deal. Unknowingly, your magazine in particular, and science fiction in general, have been a great influence in the shaping of my life. The credit is due mainly to the articles that appear regularly in *ASF*, and to your editorials. I have just won a scholarship to the University of Chicago and I will take up biochemistry or, more likely, biopsychology. . . ."

In my profession, I help teach medical students every year, but these are young men who have already chosen their vocation. These young men have been won for science long before I see them.

By way of my spare-time occupation as science fiction writer, however, I now have evidence that occasionally I help to win the initial victory and encourage a youngster to go into science who might otherwise not do so. Extrapolate this to science fiction in general and think of the many youths who are won silently and who do not bother to advertise the victory. It is then that the writing of science fiction becomes more than merely a pleasant way to add to my income.

The Handbook of Biological Data

T. C. BYERLY, *U. S. Department of Agriculture*

THE Handbook of Biological Data, in preparation by a National Academy of Sciences-National Research Council committee for the past seven years, was published by W. B. Saunders in October 1956. More than 17,000 biologists have contributed to the preparation of the first Handbook of Biological Data. The need for such a handbook, including selected, authoritative, standard values and estimates of variability for such values, is obvious to every biologist who needs information outside the immediate field within which he may himself be authoritative. The teacher, the student, and the industrial user of biological materials have equal need with the research worker. The Handbook was prepared for all these biologists and it will be useful to them.

The initiation of the Handbook and its accomplishment during the seven years of its preparation are the result of the imagination, confidence, and perseverence of a few biologists who have planned and executed the task and the vision and funds of sponsoring agencies, as well as the voluntary contributions of data, and selection, summary, and evaluation of data by thousands of biologists.

To Dr. J. W. Heim, Aero Medical Laboratory, Wright Air Development Center, Wright-Patterson Air Force Base, Ohio, and to Paul Weiss, then Chairman of the Division of Biology and Agriculture, belong the principal credit for development of the idea that in one handbook there should be the standard values for biological materials and processes in all areas of biology. Dr. E. C. Albritton, the first editor, and his staff developed procedures for selecting, obtaining, summarizing, and evaluating data. No man ever set more exacting and precise standards for preparation of a compendium than did Albritton. The willingness of the thousands who have contributed time and thought to the preparation and evaluation of Handbook tables is recognition of the confidence instilled by the standard of excellence set by Albritton. There was no compromise on Albritton's part in his search for the most reliable data and their confidence limits. The Handbook is no clerical summation of averages, it is a series of tables of authenticated values, authenticated by persons wholly competent in the field covered by the specific table or, more narrowly, of particular values within a table. The standards set and the procedures initiated by Albritton have been carried out by William Spector, the present editor, and a dedicated staff. Spector has made himself a living part of the Handbook undertaking. For him, the Handbook is not a task but a challenge; completion of the first edition is a first milestone in the establishment of this basic book of biology.

The Handbook Committee has served effectively as an advisory and review board. Its basic task was the definition of scope and of audience to whom the Handbook is addressed. It was their decision that the Handbook should be abridged and that it should be addressed primarily to persons with frequent need of information outside their own area of specialization. Every member has contributed to definition of the parameters within which the first edition has been abridged. They have aided in selection of topics, in evaluation of proposed tables, and in the weighing of areas to be covered. They have reviewed procedures for selection and authentication of data.

This first edition of the Handbook contains some tables in each of the major areas

of biology. Space devoted to particular areas must reflect in some measure the availability of important, quantitative data within that area. Later editions will include additional tables as users define deficient areas and adequate data become available.

While the major portion of the Handbook consists of tabular data, diagrams, concise summary statements, and structural formulae have been used when appropriate. The diagrams indicating pathways of metabolism, of the theories of blood coagulation, and others, provide elegant, simple presentations of complex basic theory. Words, not numbers, were needed to construct tables concisely stating and relating structure and function. Qualitative data, or those crudely but not numerically quantitative, have been expressed in words or, in a few cases, by the traditional pluses and minuses. In fact, no appropriate means of printed communication has been avoided if that method was required to present essential information.

A National Conference of Editors

THE enormous, continually expanding mass of biological knowledge is published in more than 20,000 serials. Monthly, new journals are being initiated. This flood of literature poses problems for the researcher, the author, the editor, the publisher, the abstract services and the index services. Few research biologists can be currently aware of the total knowledge available in their field of specialization. One biologist reported that it would be necessary to read eight hours a day for fifteen years to cover all of the pertinent material published in 1954-55 in his field.

This large array of journals does not provide a satisfactory outlet for much of the new knowledge being created. The author must often accept long delay in obtaining publication of his investigations or must publish in obscure places. Too, the author, finding much variation in style and format between the serials, must rewrite his paper for each journal.

The editor, usually a volunteer burdened with manuscript he cannot publish and sometimes cannot understand, spends much of his time in managerial routine. Rarely does he have time to give serious consideration to editorial problems or to precise criticism of manuscripts. The publisher, especially the society-publisher, is faced with need to publish more pages together with a rapidly increasing cost of publication. The abstracting and indexing services cannot provide proper cover in biology—the science in which adequate coverage is most urgently required.

A review of the present means of publishing and retrieving information suggests that new mechanisms for primary publication must be sought. Microforms (microcards, microprint, microfilm, minicards) may provide the basis of a system replacing the printed page in primary publication. The utilization of such devices will simplify the development of mechanisms for automatic retrieval. The problems of documentation, coding and automatic retrieval are not problems of editors, but changes in methods of primary publication will pose many new problems for editors.

The Publications Committee of the American Institute of Biological Sciences, recognizing the need for a review of editorial problems, held a preliminary conference of twelve editors in 1955. This conference, supported by the National Science Foundation, emphasized the need for concerted, coordinated action to cope with the many problems associated with the publication and utilization of biological literature. The members of the preliminary conference suggested three major categories of problems: problems of expense; problems of selection; problems of indexing and abstracting.

The recommendations of the preliminary conference have formed the basis of planning for a larger conference of 40 to 50 editors. This conference, supported by the National Science Foundation, will be held during early spring of 1957.

Fred R. Cagle, Chairman, Department of Zoology, Tulane University has accepted the responsibility for directing the conference. A staff is now compiling data pertinent to the problems posed by the preliminary conference.

One of the most urgent sets of problems is associated with the cost of publication. There may be procedures in the economy and management of scientific journals that might be advantageously adopted by a group of journals. Discussion, based on data to be provided by the planning group, will explore the potentialities of cooperative management and consolidation of serials.

The question of cost is related to the form of publication. If biologists could accept the supplementary publication of detailed documentation as microforms available on demand, the size of journals could be reduced. This would simplify abstracting, indexing and the retrieval of information. Many biologists bieleve that much of the specialized material published in our serials is of specific interest to fewer than fifty biologists in the world. In contrast, the major conclusions or units of knowledge may be of general interest. The publication of a "boiled down" version would reduce the cost of publication, simplify review of the biological literature, and permit more detailed reports of procedure and data. A biological science newspaper as suggested by Ralph E. Cleland may be a practical solution. Each biologist could survey a larger segment of literature per unit of time.

If the present method of publication is continued, it is urgent that editors develop a better basis for selection and a higher degree of policy consistency between journals. As a consequence of increased printing costs, more and more journals are forced to depend upon the volunteer services of scientist-editors who can accept such responsibility only by sacrificing their other productive labors. Unfortunately, financial pressure dictates that the editor must often assume responsibility for all the routine managerial details involved in the publication of a journal. Printers' deadlines compel him to concentrate his energies on the routine of production. Absence of competent editing has led to the reduction of editorial standards and to the development of an author attitude that concise writing is unimportant. The resultant poor writing has led to further expansion of the literature. The editor, faced with a continually increasing volume of submitted manuscripts, often establishes policies directed toward restricting the length of manuscripts. This has reduced prolixity but has caused the division of long manuscripts into many short manuscripts—creating another series of problems for bibliographers. This restriction of size rather than increased emphasis on preciseness and clarity has brought about the elimination of sections on procedures and evaluations.

The conference will be concerned with problems of editorial policy. The publication of a general style manual for biological journals will be considered. Such a style manual would include the standardization of biological terms, symbols, citations, principles for the writing of titles, formulation of standards in preparation of abstracts, and a statement of writing procedures designed to better insure preciseness and clarity of expression. This manual would simplify the task of editors and would reduce the burden on the author seeking a publication outlet.

Abstracting services have emphasized that they could provide a much increased coverage of the literature of biology if editors could consistently cooperate in the provision of adequate author abstracts. The conference will review problems related to the preparation and distribution of abstracts as well as the expansion of abstract services. The improvement of writing and the increase in brevity would remove some of the major indexing problems and make easier the provision of punch card devices or magnetic tape devices for indexing, sorting and location of material.

Many editors and authors have received questionnaires from the planning group. The information from these questionnaires together with that obtained from interviews and reviews of reports by specialists will be included in a portfolio provided each member of the conference in March.

FRED R. CAGLE

Russian-English Translation Programs in Biology

THE problem of adequately handling the current output of English-language scientific publication has been an overwhelming one for some time to librarians, abstracting services and scientists alike. Accompanying this problem, and growing ever more serious, was the realization that very little Russian research literature was available to scientists in this country because of translation difficulties. Several organizations became concerned and subsequently involved in plans to translate and publish representative Russian journals. That *Bulletin* readers may be properly informed about these projects and activities in the field of biology, the following information has been brought together.

Three government agencies are primarily concerned with these projects and with the financial support of translation and publication: The National Science Foundation, The National Institutes of Health and the Atomic Energy Commission.

In 1956 the translation of abstracts in the biological sciences from *Referatiznyi Zhurnal* (Reference Journal) was begun by Biological Abstracts under a grant from the National Science Foundation. These translations will appear from now on as part of the regular Biological Abstract sections.

In November 1956 a grant of $57,860 was made to the American Institute of Biological Sciences to administer a program of translating and publishing four Soviet biological research periodicals. This translation and publication has been contracted by the Institute to Consultants Bureau, New York. The four journals to be translated are *Mikrobiologiia* (Microbiology), *Fiziologii Rastenii* (Plant Physiology), and the plant sciences and biological sciences sections of *Doklady Akademii Nauk USSR* (Proceedings of the USSR Academy of Science). The first two journals will be translated *in toto* and will appear six times a year. Subscription prices will be $20 and $15 per year respectively. The plant and biological sections of the *Doklady* will be translated and published in separate bimonthly periodicals. The plant sciences section will carry a subscription price of $7.50 per year and the zoological sciences $20. Subscriptions for these translations should be addressed to: The American Institute of Biological Sciences, 2000 P St., N.W., Washington 6, D. C.

The National Institutes of Health, through an appropriation of $233,000 from Congress, is launching a broad program of translating and disseminating Russian publications, primarily in the medical sciences. The journals and materials translated will be distributed by N. I. H. to tax supported and non-profit medical and scientific libraries and to Government agencies. Additional copies will be made available for purchase at a substantially reduced price. The first two Soviet journals selected under the new program are *Biokimiia* (Biochemistry) and *Biulletin' Eksperinental' noi Biologii i Meditsiny* (Bulletin of Experimental Biology and Medicine). The 1956 issues of these two journals have been purchased by N. I. H. from Consultants Bureau (where they have been published previously on a commercial basis) for distribution to non-profit libraries. Consultants Bureau (227 West 17th St., New York 11, N. Y.) will simultaneously offer these volumes for sale at a reduced rate.

A second feature of the N. I. H. program calls for the translation of sections of *Sovetakoe Medetsinskoe Referativnoe* (Soviet Medical Reference Review), an extensive abstract journal wholly devoted to Soviet contributions. The four sections selected for translation are: Microbiology, and Infectious Diseases; Oncology; Normal and Pathological Physiology, Biochemistry, Pharmacology and Toxicology; Internal Diseases.

Six other Russian journals will be translated and published by N. I. H. through a contract-publisher later in the spring of 1957. A notice will appear in *Bulletin* columns when details are announced. Subscription prices will likely range from $15 to $25. The six journals to be translated are: *Biofizika* (Biophysics); *Fiziologicheskii Zhurnall USSR im. I. M. Schenova* (Sechenov Physiological Journal of the USSR); *Voprosy Onkologii* (Problems of Oncology); *Voprosy Virusologii* (Problems of Virology); *Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii* (Journal of Microbiology, Epidemiology and Immunobiology); and *Problemy Gematologii i Perelizaniia Krovi* (Problems of Hematology and Blood Transfusion).

A third aspect of the National Institutes of Health program involves the selection of a limited number of monographs for translation and publication. Selection will be made by a special committee of scientists called together for this purpose. Additional suggestions for significant Russian-language monographs are being solicated by N. I. H. from American scientists.

The publication of a Russian-English Medical dictionary, a directory of 500 Soviet research institutes, and a guide to translating services, are also planned by N. I. H. as part of its program. A annotated bibliography of manuscripts or published articles by American biologists and medical men who have visited Russia and written of their experiences, has also been compiled and is available in mimeographed form from N. I. H.

That the fringe areas and areas of specialization will not be neglected in translation projects, another plan has been initiated by N. I. H. Some 70 editors of professional journals have been approached about choosing from the table of contents of Russian journals (counterparts of their specialized U. S. journal) articles they would like to see appear in their journals in translated form. N. I. H. will have the chosen articles translated and sent to the editors. This project should do much to: (1) widen the scope of Russian research translated and bring in specialized areas that might be missed in the other undertakings, (2) put the selection in the hands of editors, and (3) place the publication of such translations in accustomed channels, rather than in newly created ones.

To return to the translations activities of the National Science Foundation; a grant of $20,350 has been made to the Special Libraries Association to operate a Scientific Translations Center. This Center will collect, announce, and sell photocopies of scientific translations of articles from all languages. This new SLA Center will be located at the John Crerar Library, Chicago and will represent the integration of two smaller centers that have been in operation for several years.

The Crerar Library has been gathering translations from all languages except Russian for some time. The Library of Congress meantime, with National Science Foundation funds, has been operating a Russian Scientific Translations Center for the translation of Russian scientific documents only. The new SLA Center will thus begin with a collection of over 10,000 translations in science, technology and medicine from previously divided efforts. The Crerar Library previously published a monthly bibliography, *Translation Monthly*. This will now be subject indexed and greatly expanded but retain the former subscription price of $5 per year.

The National Science Foundation sees its efforts in this area falling into four phases. The first phase will seek to assure that original source material is obtainable within the United States so that when a scientist searches the literature to determine what contributions have been made abroad, especially in Russia, he can be reasonably sure of finding the original version of a research paper in translation. The second phase is to assist in translating any periodical or book important enough to be needed in a complete version. The third phase is to assist where necessary in publising English abstracts of those foreign papers not translated in full. The fourth phase is to collect translations and information on translations so that a scientist need not inadvertently undertake to obtain a translation of a paper already available in English. *Ed.*

THE AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES

announces a program of verbatim translation of Russian Language Biological Periodicals supported by a grant from the National Science Foundation.

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Each journal will appear in translation approximately 3 to 4 months after publication in Russian. The English translations will bear the Russian volume and issue numbers. All subscriptions will be on a calendar year basis.

Applications for subscriptions and all inquiries should be directed to:

AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES
2000 P St., N.W. Washington 6, D. C.

Across the Editor's Desk

• **A symposium on host-specificity and parallel evolution among parasitic insects and worms will take place at Neuchâtel, Switzerland, from April 15-18. 1957,** under the chairmanship of Ernst Mayr (Harvard University).

The aim is to bring together both parasitologists and specialists of the vertebrate host groups to discuss the various problems which have been tentatively grouped under the following headings: adaptation, dispersal, speciation, and phylogeny.

The following specialists have agreed to present reports or to take part in the discussions: *Hosts:* Harrison-Mathews (London), B. Patterson (Harvard), Kuhn-Schneider (Zurich), Marshall (London), Stresemann (Berlin). *Parasites:* Baer (Neuchâtel), Chabaud (Paris), Clay (London), Dubois (Neuchâtel), Euzet (Montpellier), Hopkins (Tring), Kent (Baltimore), Llewellyn (Birmingham), Manter (Lincoln, Nebraska), Theodor (Jerusalem). It is planned to have all the reports available at the meeting in either mimeographed or printed form so as to make translations unnecessary and to leave more time for discussions.

This symposium is being held under the auspices of the International Union of Biological Sciences, and the University of Neuchâtel. Further particulars may be obtained from the General Secretary, Dr. Jean G. Baer, C. P. 2 Neuchâtel, 7, Switzerland.

• **The Second International Congress of Photobiology will be held in Turin, Italy, June 2-8, 1957.** The program will consist of four symposia: (1) Biological Effects of Radiation Longer than 3200 Å (especially long ultraviolet); (2) Vision and Light Quanta; (3) Dermatoses Produced by Light and Their Photoallergic Basis; and (4) Photoreceptors in Biology. A number of invited lectures and contributed papers will be given. For detailed information concerning abstracts, reservations, etc., please contact the local Secretary General: Prof. Dr. Giuseppe Matli, Istituto di Fisica dell'Universita di Totino, Via Pietro Giuria 1, Corso Massimo d'Azeglio 46, Turin, Italy.

• **The Board of Editors of *Behavioral Science* has made available to the members of AIBS societies, who clearly identify themselves as such, a special reduced subscription rate of $5.00** (regular subscription $6.00). *Behavioral Science* is the official publication of the Mental Health Research Institute of the University of Michigan. It appears quarterly, has a current subscription list of 1400, and carries articles representative of many specialized areas of both the natural and social sciences. Please address all subscription inquiries to: Dr. James G. Miller, Chief, Mental Health Research Institute, University of Michigan, Ann Arbor, Michigan.

• **The National Science Foundation has announced a new program of Science Faculty Fellowships Awards.** The fellowships are offered as a means of improving the teaching of science, mathematics and engineering in American colleges and universities. Fellowships are being offered for study in the mathematical, physical, medical, biological, engineering and other sciences, including anthropology, psychology, geography and certain interdisciplinary fields. Approximately 100 awards will be announced in March, 1957. The Science Faculty fellowships are available to any citizen of the United States who holds a baccalaureate degree or its equivalent, has demonstrated ability and special aptitude for science teaching and advanced training, has taught at the collegiate level as a full time faculty member for not less than three years, and intends to continue teaching. Stipends will be individually computed in such a way as to match as closely as possible the regular salary of recipients. The Foundation's award will be adjusted so that in no case will the combined support from the Foundation and any other sources exceed $10,000 per annum. Additionally, allowances will normally be made to assist in defraying costs of travel and certain other expenses associated with the followship study. Fellows may study at any accredited non-profit institution of higher education in the United States or similar institutions abroad approved by the Foundation. Tenures of three to fifteen months are available. Selection will be based on letters of recommendation, academic records and other appropriate evidences of professional activity and competence. Application materials may be obtained from the Division of Scientific Personnel and Education, National Science Foundation, Washington 25, D. C.

• **The National Institutes of Health have announced the establishment of a Center for Aging Research.** G. Halsey Hunt, presently associate Chief of the Service's Bureau of Medical Services, has been appointed director of the Center. The primary objective of the new program is to encourage and support additional research into the mechanisms involved in aging. The program will assist universities and other research institutions in establishing a broad research program in aging, to be supported in part by research grants from the National Institutes of Health.

• **Colleges and Universities in the United States, Cuba and Hawaii recently received a total of $196,383 in grants from Research Corporation to aid basic research in science.** The grants, which are distributed quarterly, will aid investigations in chemistry, physics, astronomy, mathematics and engineering. A total of $630,551 has been distributed so far this year by the Corporation (405 Lexington Ave., New York 17, N. Y.).

• **The National Science Foundation has announced the award of 50 postdoctoral fellowships for advanced study and research in the natural sciences.** Of the awards, 22 were in the life sciences, 10 in chemistry, 10 in physics, 4 in mathematics, 2 in earth sciences, one in engineering and one in the area of convergence between the natural and social sciences. These fellowships are in addition to the 895 fellowships awarded by the Foundation in March 1956. The Foundation has reopened its Senior Postdoctoral program and its regular predoctoral and postdoctoral fellowship program for the academic year 1957-58. Awards will be made in March 1957.

• **An annual award of $250.00 has been established by Henry and Ida Schuman of New York City for an original prize essay in the history of science and its cultural influences.** This competition is open to undergraduate and graduate students in any American or Canadian college, university, or institute of technology. Papers submitted for the prize competition should be approximately 5,000 words in length, exclusive of footnotes, and thoroughly documented. It is hoped that the prize-winning essay will be suitable for publication in *Isis*, the journal of the History of Science Society.

It is the wish of the donors that "History of Science and Its Cultural Influences" should be broadly interpreted. The papers —which should in each case be original contributions to learning—may deal with the ideas and accomplishments of scientists in the past; they may trace the evolution of particular scientific concepts; or study the historical influences of one branch of science upon another. The phrase "cultural influences" is taken to include the growth of science, or the effects of scientific developments upon society in the realms of philosophy, religion, social thought, art and literature, economic progress, etc. Essays dealing with medical subjects are not acceptable, although papers dealing with the relations between medicine and the natural sciences will be welcomed.

Papers submitted for competition should be sent to the Chairman of the Prize Committee, Professor Harry Woolf, Department of History, University of Washington, Seattle 5, Washington. Inquiries about the competition may also be addressed to Professor Woolf. To be eligible for consideration, papers must be received on or before the first of June, 1957. The announcement of the prize-winning essay will be made at the annual meeting of the History of Science Society, which occurs in December of each year.

• **The American Institute of Physics is embarking on a fund-raising campaign for $500,000 to finance a new headquarters building in New York City, to expand the publishing of technical journals and to attract more well-qualified young men and women to the**

profession of physics. The Institute is an association of five professional societies with 17,000 members. The present offices of the Institute are at 57 East 55th Street but another building has been purchased at 335 East 45th Street, close to the United Nations Plaza. This four storied building is being remodeled and will provide three times the present working space. The AIP staff has grown from 25 to 60 since the present building was occupied in 1943. The Institute's membership has more than doubled and the number of journal pages published annually increased four times in the same period. This steady growth of the Institute of Physics should be most encouraging to biologists whose Institute is very similar but younger.

• **The National Science Foundation, the National Academy of Science-National Research Council, and the American Documentation Institute have announced the joint sponsorship of an International Conference on Scientific Information** to provide for a thorough discussion of present developments and research pertaining to the organization and dissemination of scientific information, with special emphasis on storage and retrospective search. The conference will be held in Washington, D. C., early in November 1958.

The subject matter to be covered at the Conference will be grouped in the following general areas: (1) Requirements of scientists for scientific literature and reference services; knowledge now available and methods of ascertaining their requirements. (2) Function and effectiveness of abstracting and indexing services for storage and retrieval of scientific information and possible development of such services. (3) Effectiveness of scientific monographs, compendia and specialized information centers for storage and retrieval of scientific information; survey of present practices, trends and new and proposed techniques. (4) Organization of information for storage and retrospective search; comparative characteristics of existing systems. (5) Organization of knowledge for storage and retrospective search; conceptual and mechanical problems in the design of new systems. (6) Responsibilities of governmental bodies, professional societies, universities, and research and industrial organizations for research and training in scientific documentation and for operation of scientific information services.

Individuals interested in submitting papers for this Conference should communicate, not later than January 31, 1957, with the Executive Secretary, Dr. Alberto F. Thompson, International Conference on Scientific Information, National Academy of Sciences-National Research Council, 2101 Constitution Avenue, Washington 25, D. C.

• **The Director of the National Science Foundation and the Surgeon General of the Public Health Service have jointly announced their agreement to increase the stipends of fellowships awarded by these two Government agencies.** The stipends are being adjusted to make them more nearly comparable to awards from other sources. Stipends will be increased for all awards activated on and after January 1, 1957. The new stipends at the predoctoral level for the first year will be $1,600, intermediate year $1,800, terminal year $2,000 (former stipends $1,400, $1,600 and $1,800 respectively). The new stipends at the postdoctoral level for the first year will be $3,800, second year $4,200, third year $4,600 (former stipends $3,400, $3,700 and $4,000 respectively). Allowances, which include tuition, certain travel expenses, and $350 for each dependent, will remain unchanged.

• **A symposium on *Photography as a Visual Complement in Biological and Medical Communication* is being planned by the Biological Photographic Association for March 28, 1957,** during the International Photographic Exposition, to be held in Washington, D. C., March 22-31, 1957. The Exposition will be the largest presentation of equipment and processes ever held in the U.S.A. The aim of the international, day-long Symposium planned by B.P.A., is to explore applications of biological photography in the fields of teaching, publications, public relations and international relations. The papers presented at the Symposium will be published later by the Association. Further information about the Symposium may be obtained by writing: H. Lou Gibson, President, Biological Photographic Association, 343 State St., Rochester 4, N. Y.

• **The new Norman W. Church Laboratory for Chemical Biology, at the California Institute of Technology, was formally dedicated in November, 1956.** The new building, constructed at a cost of $1.5 million, is five floors high and connected in one wing to the Crellin Laboratory of Chemistry and in another to the Kerckhoff Biological Laboratories. Research work in the new Church Laboratory will be directed by George W. Beadle, Chairman of the Division of Biology and Linus Pauling, Chairman of the Division of Chemistry and Chemical Engineering. A staff of 70 research workers will conduct projects in such areas as the biosynthesis of proteins and amino acids, the structure of the gene and the mechanisms of inheritance, the processes of cell division and growth, the structures and properties of antibodies, enzymes, viruses and bacteria, and the molecular abnormalities that appear to cause certain diseases, both physical and mental.

• **The Marine Biological Laboratory at Woods Hole, Massachusetts, is offering a training program in Nerve-Muscle Physiology.** The program will be under the direction of Drs. S. W. Kuffler, C. L. Prosser and G. B. Kielle. Opportunities to discuss problems in nerve-muscle physiology and to use experimental electrophysiological and histochemical techniques will be available during June, July and August 1957. Financial aid will be provided to nine pre- and post-doctoral fellows. Applications should be made to the Director, Marine Biological Laboratory, not later than February 1, 1957. This program is being supported in part by a training grant of the National Heart Institute.

• **The Highlands Biological Station, North Carolina, has announced that applications are now being received for National Science Foundation Grants-in-aid for work at the station during the summer of 1957.** Closing date for receipt of applications is March 1, 1957. The following grants-in-aid are available: postdoctoral $500; predoctoral $400; graduate student $200. The proposed research must be concerned with the biota of the Southern Appalachians and may involve any of the various fields of biology. For detailed information and application forms, write, Prof. Thelma Howell, Highlands Biological Station, Wesleyan College, Macon, Ga.

• **The Council on Library Resources, Inc., a non-profit educational research organization has been incorporated in the District of Columbia, with offices at 1025 Connecticut Avenue.** The Council, whose purpose is to assist in solving the problems of libraries generally, and of research libraries in particular, will provide grants for the support of research and the demonstration of new techniques and methods. It will also undertake to coordinate efforts to improve the resources and services of libraries, and to improve relations between American and foreign libraries and archives. A $5 million grant of funds from the Ford Foundation will support its initial activities over a 5 year period. Verner W. Clapp, formerly chief assistant librarian of the Library of Congress, was elected president and executive head of the Council. Scientists on the board of directors include Joseph C. Morris, vice-president of Tulane University and Warren Weaver, vice-president of the Rockefeller Foundation.

• **The First International Conference on Operations Research will be held in Oxford, England, September 2-6, 1957,** sponsored by the Operational Research Society of Great Britain, the Operations Research Society of America and the Institute of Management Sciences. Delegations are being organized by local societies in France, Germany, Italy, Norway and Japan, and the interest in this rapidly developing new science is expected to bring observers from several other countries also. Papers on operations research or its applications are now being selected for the agenda, later to be published in full as a single volume of *Transactions*. Summaries of about 200 words' length should be sent to Thornton Page, Operations Research Office, 7100 Connecticut Ave., Chevy Chase 15, Maryland.

• **Francis O. Schmitt,** professor of biology, Massachusetts Institute of Tech

nology, recently received a joint 1956 Albert Lasker Award with **Karl Mayer,** professor of biochemistry, Columbia University College of Physicians and Surgeons, for "pioneering studies of the biochemical components of connective tissues, contributing to new understanding of arthritis and rheumatic diseases."

• **Kenneth B. Raper,** University of Wisconsin mycologist, was named recipient of a George I. Haight Traveling Research Fellowship. The fellowships were established in 1956 and are supported by funds provided by the Wisconsin Alumni Research Foundation. Dr. Raper will spend time at three laboratories, in Paris, Holland and England.

• **Reinhold Rudenberg,** professor emeritus of Harvard University, and inventor of the electron microscope, was honored in November when a document and medal conferring the rank of Honorary Senator of the Berlin University of Technology was presented by the German consul in Boston. Professor Rudenberg invented the electron microscope in 1931 in Hanover, in an effort to find a better instrument to study poliomyelitis.

• **The 1956 Woodward lectures at Yale University were given by H. Goodwin,** author of *The History of the British Flora,* reviewed in the November 1956 *AIBS Bulletin.*

• **Two science writers who have covered several AIBS annual meetings were recent recipients of the American Heart Association's Howard W. Blakeslee awards** for outstanding reporting in the field of heart disease. **Frank Carey,** Associated Press, Washington, D. C., received his award for year-round news coverage of developments in cardiovascular research, treatment and prevention. **Nate Haseltine,** Washington Post and Times Herald, was cited for his series of six newspaper articles entitled, "Within a Child's Heart," covering heart disease in childhood, including advances in heart surgery and the prevention and treatment of rheumatic fever.

• **Thomas M. Rivers,** formerly vice-president of the Rockefeller Institute for Medical Research, has been appointed medical director of the National Foundation for Infantile Paralysis. He succeeded **Hart E. Van Riper,** who has accepted the position of medical director of Geigy Pharmaceuticals.

• **Madison D. Cody,** professor of botany at the University of Florida, retired July 1956.

• **Mason R. Boudrye,** associate professor of biology at Moorhead State Teachers College has accepted the position of permanent executive secretary of the Minnesota Academy of Science. Through the support of the Louis W. and Maud Hill Family Foundation, a permanent office for the Academy has been established at the Science Museum in St. Paul. Dr. Boudrye is the first full-time secretary and will devote his time to furthering the activities of both the junior and senior academies in the state.

• **George P. Fulton,** professor of biology, has been appointed chairman of the department, Boston University, College of Liberal Arts. He succeeds **Brenton R. Lutz.**

• **The Kalinga Prize of UNESCO was awarded this year to George Gamow,** professor of physics at the University of Colorado. The prize, awarded annually to a science writer selected by an international jury, was established in 1952, by B. Parnaik, of Cuttack, Orissa, India, for the dual purpose of recognizing outstanding interpretation of science of the general public and of strengthening scientific and cultural link between India and other nations. The winner receives a prize of 1000 pounds sterling, is invited to the annual meeting of the Indian Science Congress, and spends a month visiting and lecturing in India.

• **Henry W. Schoenborn,** University of Georgia, has accepted a position as professor of zoology at the University of Maryland.

• **Jack McCormick, American Museum of Natural History, New York, is organizing a series of regional vegetation bibliographies that will cover both North and South America.** The bibliographies are to be issued by the Museum. Anyone having geographically arranged files of flora (other than strictly taxonomic works) or vegetation of all or any portion of the American continents, is urged to communicate with Dr. McCormick (American Museum of Natural History, Central Park West at 79th St., New York 24, N. Y.).

• **William M. Mann, for 31 years director of the Smithsonian Institution's National Zoological Park, Washington, D. C., retired in October 1956.** The Washington Zoo, under Dr. Mann's direction has become one of the best and most representative collections of living animals in the world. Before going to the zoo, Dr. Mann was an entomologist with the U.S.D.A. His academic training was received at the State College of Washington, and Stanford and Harvard Universities. During his years at Harvard, under William M. Wheeler, he became a student of ants. Recently, he presented his huge personal collection of more than 117,000 species, to the Smithsonian Institution. Dr. Mann will continue his association with the Smithsonian in the capacity of honorary research associate, the institution's highest honorary designation.

Theodore H. Reed, who has been chief veterinarian of the Zoo since 1955, has been named acting director.

• **A 180-acre tract of woodland, from the estate of W. C. Allee, has been given to Wabash College.** The College has agreed to keep the tract inviolate for 99 years and during that period, keep records of the changes in animal and plant life. Dr. Allee served on the faculty of the University of Chicago for 30 years before he retired to teach another five years at the University of Florida. A committee has been appointed by the President of Wabash College to plan ecological studies on the tract and maintain the agreement about its condition.

• **Charles Darwin's historic round-the-world trip in 1831-1836, will be retraced in 1958 by a group of 20 scientists,** who will be selected as Darwin Fellows to sail on the expedition. The trip will be in celebration of the centennial of Darwin's presentation of his paper outlining his theory of evolution to the Linnean Society in London. Julian S. Huxley is cochairman of the Darwin Anniversary Committee with Lady Nora Barlow, a descendant of Darwin. The original expedition visited islands in the Atlantic, the coast of South America and adjacent islands, and islands of the western Pacific. The 150 ft. sailing ship, with auxiliary engines, that will be used on this return trip, will touch at the same places and compare ecological conditions today with those of 125 years ago. The 1958 trip will also seek to determine if any species are in danger of becoming extinct.

• **Franz Lipmann,** 1953 Nobel prize winner in medicine and physiology, and presently professor of biological chemistry at Harvard Medical School, will become a member of the Rockefeller Institute of Medical Research in the summer of 1957. His research on the biochemical conversion of food into energy will continue in new laboratories to be constructed for him at the Rockefeller Institute. He will also participate in the program of graduate education that was begun at the Institute a year ago.

• **William P. Jacobs,** biology department, Princeton University, will spend the spring and summer of 1957 at the Marine Station, Naples, Italy, on a National Science Foundation Postdoctoral Fellowship. While there, Dr. Jacobs will work on the normal and experimental development of various siphonaceous algae.

• Dissension over the provisions of the current edition of the International Code of Nomenclature of Cultivated Plants (1952), prompted the International Union of Biological Sciences to recently activate its **International Commission on the Nomenclature of Cultivated Plants.** The Commission is composed of eight representatives each of horticulture, agriculture, and forestry, plus a Chairman and Rapportour General. American members of the Commission, which held its first meeting in Utrecht, November 22-24, 1956, under auspices of I.U.B.S., are Drs. Martin Weiss (agriculture) U. S. Department of Agriculture, Elbert L. Little (forestry) U. S. Bureau of Forestry, and George H. M.

Lawrence (horticulture) Bailey Hortorium, Cornell University.

Scores of proposals for changes in the present Code had been studied previously and were voted on at this session. Paramount among the decisions adopted unanimously was that to retain the name *cultivar* as the international term for all cultivated variants (reserving the technical term *varietas*, and its abbreviation var., for the well known botanical category), and to authorize use of the alternate term in various national languages (such as "Sorte" in German, "razza" in Italian, and "variety" in English).

The Commission agreed on the need of a single Code for all concerned with cultivated plants, and took steps to simplify the present one. Ample opportunity will be provided all interested groups to study the new edition in preparation, following which it will be submitted to several international bodies for endorsement and adoption. Persons desiring further information on the work of this Commission or wishing to submit proposals for its consideration are invited to contact its secretary, Dr. Harold R. Fletcher, Royal Botanic Garden, Edinburgh, Scotland, or any one of the above-named American representatives.

• **Entries are now being accepted for the distinguished Oberly Memorial Award,** made every two years by the American Library Association, for the best bibliography in the field of agriculture or the related sciences. The current award, to be made at the American Library Association Annual Conference in Kansas City, Missouri, June 23-29, 1957, is for a bibliography, by a citizen of the United States, issued in 1955 or 1956. Final entry date is March 15, 1957. Seven copies of the bibliography should be sent to Whiton Powell, Chairman, Albert R. Mann Library, Ithaca, N. Y. An accompanying letter should state that it is being submitted for consideration for the Oberly Award. Points to be considered in judging will be: accuracy, scope, usefulness, format, and special features such as explanatory introductions, annotations, and indexes. The award (income from a fund of about $1200) was established in 1923 by colleagues of Eunice Rockwell Oberly, late librarian of the Bureau of Plant Industry, U.S.D.A.

• **The American Type Culture Collection has moved to new quarters at 2112 M Street, N.W., Washington 7, D. C.** Additional space and improved facilities for processing and storage are provided in the newly remodelled building.

• **The U. S. National Committee for the International Geophysical Year 1957-58, has approved the establishment of a microbiological survey in Antarctica,** to be undertaken during the 1957-58 period in conjunction with the U. S. program. The survey was suggested by the Society of American Bacteriologists. The program is being formulated by a committee composed of: Claude E. ZoBell (Chairman), Richard H. McBee and Fredcrick D. Sisler.

• **Leland Shanor,** formerly professor of botany and curator of the mycological collections at the University of Illinois, accepted in September 1956, the position of the head of the new Department of Biological Sciences at Florida State University, Tallahasee. The new department includes the former departments of botany, bacteriology, physiology and zoology.

• **Howard T. Odum,** Duke University, has accepted the position of Director of the University of Texas Institute of Marine Sciences at Port Aransas, Texas.

• **George H. Bick,** Tulane University, has accepted a position at Southwestern Louisiana Institute of Lafayette.

• **The Los Angeles State and County Arboretum officially dedicated a new Administration Building and Gatehouse-Information Center in December.** William S. Stewart, Director of the Arboretum and F. W. Went, President of the California Arboretum Foundation participated in the ceremonies.

• **The fourth Southern Regional Graduate Summer Session in Statistics will be held during the summer of 1957 from June 12-July 20 at the Virginia Polytechnic Institute, Blacksburg, Virginia.** The three previous sessions were held at the Virginia Polytechnic Institute, the University of Florida, and North Carolina State College in that order. In 1958, the summer session will be held at Oklahoma Agricultural and Mechanical College. Students who attended past sessions come from all of the forty-eight states, South America, India, Finland, Canada, Australia, Hawaii, China, the Philippines, and Africa. The enrollment at each of these sessions has exceeded one hundred graduate students.

The summer sessions are designed to carry out a recommendation of the Southern Regional Education Board's Committee on Statistics, on which the four institutions initiating the program are represented. The sessions will be of particular interest to (1) research and professional workers who want intensive instruction in basic statistical concepts and who wish to learn modern statistical methodology, (2) teachers of elementary statistical courses who want some formal training in modern statistics, (3) prospective candidates for graduate degrees in statistics, (4) graduate students in other fields, who desire supporting work in statistics, and (5) professional statisticians who wish to keep informed of advanced specialized theory and methods.

Each annual summer session lasts six weeks and each course offered carries approximately five quarter hours of graduate credit. The program may be entered at any session, and consecutive courses will be offered in successive summers. The summer work in statistics may be applied towards residence requirements at any one of the cooperating institutions, as well as certain other institutions, in partial fulfillment of residence requirements for graduate degrees.

The faculty for the 1957 session at the Virginia Polytechnic Institute will include Evan J. Williams, Principal Research Officer, Commonwealth Scientific and Research Organization, Division of Mathematical Statistics, Ontario Research Foundation, Toronto, Canada; J. L. McHugh, Director, Virginia Fisheries Laboratories; and the following staff members from the Virginia Polytechnic Institute: Willard O. Ash, L. S. Brenna, Ralph A. Bradley, C. W. Clunies-Ross, John E. Freund, Rudolf J. Freund, Boyd Harshbarger, Clyde Y. Kramer, and R. Lowell Wine.

The total tuition fee will be $36.00 for the six-week term.

Inquiries should be addressed to Boyd Harshbarger, Head, Department of Statistics, Virginia Polytechnic Institute, Blacksburg, Virginia.

• ***Biological Materials. Part 1. Preserved Materials and Museum Collections*** has been issued as Publication 399 of the National Research Council (2101 Constitution Ave., Washington 25, D. C.). The material in this booklet was prepared by a Committee of the Biology Council and edited by Ernst Mayr and Richard Goodwin. This analysis of preserved materials incorporates the comments and suggestions of many consultants. A second volume, on *Living Materials and Plant Resources*, is in preparation.

• **The University of Michigan Biological Station** will conduct seventeen courses and research in all aspects of field and freshwater biology this summer at its Douglas Lake station. The faculty includes 17 prominent biologists from 8 colleges and universities. Undergraduates, graduates and professional biologists may apply for admission. The total cost for the 8-week session, June 25 to August 17, need not exceed $250-$300. Approximately 30 grants-in-aid of $100-$300 each and 25 self-help jobs will be selectively awarded. For further information, write: Biological Station, University of Michigan, Ann Arbor, Mich.

• **Recent deaths among biologists:**

LeRoy Abrams, Stanford, Calif.; emeritus professor of botany and former director of the Stanford University's Natural History Museum. August 1956, 81.

Wilfred H. Wright, Ottawa, Canada; former chief of laboratory services, plant products division, Department of Agriculture. September 1956, 71.

John I. Hamker, Lynchburg, Va.; emeritus biology professor of Randolph-Macon Woman's College. July 1956, 86.

Alice M. Russell, Philadelphia, Pa.; head of the biology department of Rosemont College. October 1956, 65.

Marion E. L. Richards, New York, N. Y.; retired assistant professor of botany at Barnard College. October 1956, 62.

From the Societies

• **The American Society for Horticultural Science** elected the following officers during its 1956 annual meeting at Storrs, Conn.; President: L. D. Davis; Vice-President: W. D. Pentzer; Secretary-Treasurer: Freeman Howlett, Ohio Agric. Exp. Station, Wooster, Ohio; Sectional Chairmen: (Pomology) L. P. Batjer; (Vegetable Crops) W. A. Frazier; (Floriculture & Ornamental Horticulture) V. T. Stoutmeyer; (Handling & Processing) L. L. Claypool; Editor-Business Manager: Damon Boynton; Executive Committee: O. A. Lorenz, M. B. Davis, W. T. Pentzer, Freeman Howlett.

Winners of 1957 awards in the American Society for Horticultural Sciences were: The Alex Laurie Award in Floriculture and Ornamental Horticulture: **Garth A. Cahoon** and **Duane O. Crummett;** The Charles G. Woodbury Award in Raw Products Research: **E. M. Rahn;** The Joseph Harvey Gourley Award in Pomology: **C. H. Hendershott** and **Lowell F. Bailey;** The Leonard H. Vaughan Award in Floriculture and Ornamental Horticulture: **A. A. Piringer, Jr.,** and **Neil W. Stuart;** The Leonard H. Vaughan Award in Vegetable Crops: **H. C. Mohr, H. T. Blackhurst** and **E. R. Jensen.**

• 1957 officers of the **American Dairy Science Association** are: President: C. F. Huffman; Vice-president: D. V. Josephson; Secretary-Treasurer: H. J. Judkins, 32 Ridgeway Circle, White Plains, N. Y.; Journal Editor: E. O. Herreid, University of Illinois, Urbana, Ill.

• **The National Pest Control Association** recently elected the following officers: President: Myron W. Smith; Executive Vice-President: J. C. Redd; Secretary-Treasurer: Harold Schnorrenberg, Dead Shot Chemical Co., 1830 Linwood, Oklahoma City, Oklahoma; Executive Secretary: Ralph E. Heal, 30 Church St., New York 7, N. Y.

• 1957 officers of the **American Society of Limnology and Oceanography** are: President: David C. Chandler; Vice-President: Dale F. Leipper; Secretary-Treasurer: Bostwick H. Ketchum, Woods Hole Oceanographic Institute, Woods Hole, Mass.; Members-at-large: John R. Vallentyne, John L. Hart and Herbert W. Graham.

• **The Society for Industrial Microbiology** elected the following officers for 1957: President: J. M. McGuire; Vice-President: C. W. Hasseltine; Treasurer: Charles C. Yeager; Secretary: C. L. Porter, Dept. of Biological Sciences, Purdue University, Lafayette, Ind.

• During its December Cincinnati meeting, the **American Phytopathological Society** elected the following 1957 officers: President: George W. Fischer; Treasurer: Saul Rich; Secretary: William B. Hewitt, Dept. of Plant Pathology, University of California, Davis, California.

• 1956-57 officers of the **American Physiological Society** are: President: A. C. Burton; President-elect: Louis N. Katz; Past-president: W. F. Hamilton; Executive Secretary-Treasurer: Ray G. Daggs, 9650 Wisconsin Ave., Washington 14, D. C.; Administrative Advisor to Council: Milton O. Lee; Council: A. C. Burton, L. N. Katz, W. F. Hamilton, H. W. Davenport (1957), J. H. Comrow (1958), R. F. Pitts (1959), Hallowell Davis (1960).

• **The American Association of Anatomists** elected the following 1957 officers: President: E. A. Boyden; President-elect: Barry J. Anson; President-emeritus: Samuel R. Detweiler; First Vice-president: William W. Greulich; Second Vice-president: O. V. Batson; Program Secretary: Oliver P. Jones; Secretary-Treasurer: Louis B. Flexner, Dept. of Anatomy, School of Medicine, University of Pennsylvania, Philadelphia 4, Pa.

• **The South Carolina Academy of Science** elected the following 1957 officers: President: I. S. H. Metcalf; Vice-President: H. W. Davis; Secretary-Treasurer: Margaret Hess, Winthrop College, Rock Hill, S. C.; Editor: Roberta Lovelace, University of South Carolina, Columbia, S. C.

• **The American Ornithologists' Union** at its Denver, Colorado, meeting in September elected the following officers for 1957: President: Ernst Mayr; First Vice-President: George H. Lowery, Jr.; Second Vice-President: Austin L. Rand; Treasurer: Charles G. Sibley; Secretary: Harold F. Mayfield, River Road, RFD, Waterville, Ohio; Editor: Robert W. Storer, University of Michigan, Ann Arbor, Mich.

The next annual meeting will be held at Cape May, N. J., in the week of September 9, 1957, upon the invitation of the Philadelphia Academy of Sciences and the Delaware Valley Ornithological Club.

The Brewster Medal and Award of the Union for outstanding published work on the birds of America in the last five years was conferred upon **George H. Lowery, Jr.,** of Louisiana State University, for "A Quantitative Study of Nocturnal Migration of Birds."

Ralph S. Palmer, New York State Museum was elected a Fellow of the Society. Four Corresponding Fellows were elected at the time of the meeting: **Charles M. N. White,** Northern Rhodesia, **William H. Thorpe,** Cambridge, England, **William W. A. Phillips,** Ceylon and **H. N. Kluyver,** Arnhem, Netherlands.

• **The Society for the Study of Evolution** elected the following officers for 1957: President: H. J. Muller; Vice-Presidents: E. H. Colbert, J. B. S. Haldane, Alden H. Miller; Treasurer: W. Frank Blair; Secretary: Harlan Lewis, Dept. of Botany, University of California, Los Angeles 24, California; Editor: Everett C. Olson; Council Members: D. I. Axelrod, Charles M. Bogert, Jens C. Clausen, James F. Crow, Carl Epling, Theodor Just, Ernst Mayr, Karl P. Schmidt, and Sewall Wright.

• 1957 officers of the **American Society of Naturalists** are: President: William C. Steere; Vice-President: I. Michael Lerner; Treasurer: George F. Sprague; Secretary: Bruce Wallace, Biological Laboratory, Cold Spring Harbor, N. Y.

• **The Society for the Study of Development and Growth** elected the following 1957 officers: President: Gerhard Fankhauser; Treasurer: R. W. Briggs; Secretary: Ralph O. Erickson, Dept. of Botany, University of Pennsylvania, Philadelphia, Pa.; Executive Committee: Harriet Creighton, J. D. Ebert, K. V. Thimann.

• 1957 officers of the **American Society of Ichthyologists and Herpetologists** are: President: Edward H. Taylor; Vice presidents: (finance) John C. Marr; (conservation) Laren P. Woods; (membership) A. P. Blair; Treasurer: Coleman J. Goin; Secretary: Arnold B. Grobman, Florida State Museum, Gainesville, Fla.; Editor-in-Chief: *(Copeia)* Fred R. Cagle. The Society will hold its 1957 annual meeting at New Orleans, in April.

• **P. C. Silva** was listed as Secretary of the Phycological Society of America in the November issue of the *Bulletin* but at the wrong address. Dr. Silva's correct address is: Department of Botany, University of Illinois, Urbana, Ill.

• **During its recent annual meeting at Storrs, the Ecological Society of America formally organized a Section of Animal Behavior and Sociobiology.** The purpose of this Section is "to advance, coordinate and assist research and publications on the subject of animal behavior and social organization basic to theoretical science and human welfare, and to act as a liaison agency between workers in the various scientific fields concerned." At the first organizational meeting of the Section, the following officers were elected: Chairman: J. P. Scott; Vice-Chairman: A. M. Guhl; Secretary: M. W. Schein, Pennsylvania State University, University Park, Pa.

The Section is concerning itself immediately with three major problems: publications, terminology and teaching. Lester R. Aronson, American Museum of Natural History, was named chairman of a committee to continue the search of new publication outlets for papers dealing with animal behavior. A. M. Guhl, Kansas State College, was appointed chairman of a Committee on Glossary and Terminology designed to help alleviate the confusion caused by coining new terms or mis-using old ones. W. M. Etkin, Albert Einstein College of Medicine, heads a committee that will look into the needs and possibilities of publishing a textbook on Animal Behavior and Sociobiology aimed at the

upperclass or early graduate student level.

Any member of any class of the Ecological Society of America may become a member of this new section by writing to the Secretary of the Section; there are no additional dues. Others may join the Section by becoming members of the Ecological Society. Members of the Section will receive a mimeographed Newsletter which will contain plans for meetings, programs, and other items of interest to behaviorists.

• The 1957 annual meeting of the **Biological Photographic Association** will be held in Rochester, Minnesota, August 27-30.

During the recent 1956 meeting, the Louis Schmidt Award was presented to **Mervin W. LaRue, Jr.** Fellowships in the Association were awarded to: **Frederick W. Kent, Julius Halsman, Lloyd Matlovsky,** and **Roman Vishniac.**

• **The American Society of Zoologists** elected the following 1957 officers: President: Elmer Butler; President-elect: H. Burr Steinbach; Past President: Tracey Sonneborn; Treasurer: Jane Oppenheimer; Secretary: Rudolf T. Kempton, Vassar College, Poughkeepsie, N. Y.

• **The 57th General Meeting of the Society of American Bacteriologists will be held April 28-May 2, 1957, in Detroit, Michigan.** The Sheraton Cadillac and Statler Hotels will be meeting headquarters. Further information may be obtained from the Society Secretary: J. H. Bailey, Sterling-Winthrop Research Institute, Rensselaer, N. Y.

• The 1957 officers of **Nature Conservancy** are: President. Richard H. Goodwin; Vice President: F. Raymond Fosberg; Treasurer: G. Flippo Gravatt; Secretary: Elting Arnold, Chevy Chase, Md.

Education and Manpower

• **High school teachers of biology who are especially interested in improving laboratory and field work in secondary school biology courses are invited to apply for appointment to a group that will prepare a sourcebook of laboratory and field studies for such courses.** The project is sponsored by the Committee on Educational Policies of the Biology Council, Division of Biology and Agriculture, National Academy of Sciences-National Research Council and the Michigan State University, with the support of grants from the National Science Foundation. The sourcebook will be developed at an eight-week writing conference, to be held June 24 to August 16, 1957, at Michigan State University, East Lansing, Michigan.

The material will be developed by a group of 20 high school teachers and 10 university and college biologists. The prime requirement for participants is a creative, imaginative approach to laboratory and field studies. All interested high school biology teachers are invited to apply. Biologists and school administrators are also urged to submit the names of teachers who are well qualified for the assignment. Each applicant or nominee will be sent a form asking for information on his background and experience, and evidence of his ability to contribute to the preparation of the sourcebook. The final selection will be made on the basis of two essays submitted by each applicant who passes a preliminary screening. One essay will illustrate how a topic supplied by the Committee can be converted into a study for high school use; the other will present an exercise the teacher has devised. The purpose of the essays is to give the Committee on Educational Policies a basis for judging applicants' ability to conceive and write stimulating laboratory or field studies.

The essays will also form a part of the pool of ideas for the sourcebook. Manuscripts so used will be credited to their authors, who may thus appear in the publication even if they are not selected to participate in the conference. The writing team will also have access to other collections of exercises, including those gathered by the committee in preparing a series of sourcebooks of laboratory and field studies for college courses in the biological science.

The Committee has already selected the college and university participants. This is a group of successful teachers of introductory courses. Highly skilled in developing laboratory and field instruction, they are experts in different major areas of biology, share a sympathetic understanding of secondary-school problems, and possess personal qualities that make them helpful and creative contributors in a group enterprise.

Each participant will receive a stipend of $1,000. His round trip travel expenses between his home and East Lansing will also be paid. From the stipend he will be expected to pay his own living expenses during the conference. The University will provide housing and dining facilities at reasonable prices for teachers and their families.

The Conference will be directed by Dr. C. A. Lawson, Head of the Department of Natural Sciences in the Basic College at Michigan State, and a member of the Committee's Subcommittee on Publications. Participants will have access to ample laboratory and library facilities. Exercises developed by the Conference will be tested in a variety of high schools during 1957-58, revised as necessary, and published by the fall of 1958, under the auspices of the Academy-Research Council.

Completed Applications should be submitted by January 31, 1957. All correspondence concerning the project should be addressed to:
Committee on Educational Policies, Division of Biology and Agriculture, National Research Council, 2101 Constitution Ave., Washington 25, D. C.

• **The sixteenth annual Science Talent Search will announce winners of $11,000 in Westinghouse Science Scholarships in the early spring.** In the 15 years that Westinghouse has been encouraging potential young scientists in this fashion 4500 high-school seniors have won scholarships and honorable mentions. The Westinghouse Educational Foundation, supported by the Westinghouse Electric Corporation, provides the awards and makes the Science Talent Search financially possible. Science Service, the non-profit institution for the popularization of science, administers the Search through the Science Clubs of America. Entrants in the Search must report on an original science project and take a stiff aptitude examination. Their schools then must submit scholastic records and teachers' estimates of the entrant's ability. Over 204,000 high school seniors have entered the Talent Search since its inception in 1942. Of these, 40,926 including 9,624 girls, have completed the final requirements. Westinghouse Scholarships worth $165,000 have been awarded to 460 young men and 140 young women, while 3,900 have been named for honorable mention.

Thirty states and the District of Columbia are conducting their own science talent searches concurrently with the national competition. Thus many seniors have a chance to win state scholarships after attempting to win a place in the national competition.

Six of the 1956 winners held summer jobs at the National Bureau of Standards and two held jobs at the Naval Ordnance Laboratory in Washington. Other summer jobs included: part time work at the University of Washington's cyclotron, laboratory aide at the Mayo Clinic where the student worked in the development of a technique for photographing a punctured capillary of a hemophilliac, naturalist in McCormick Creek State Park, Spencer, Indiana, and three held summer jobs at the Westinghouse Atomic Power Division and Research Laboratories.

• **The following is quoted directly from the *Engineering and Scientific Manpower Newsletter* on the subject of Selective Service.** "Memories are short and experience in the Scientific & Engineering Manpower Commission offices this past summer indicates the wisdom of reviewing some of the facts about Selective Service regulations and practice as they relate to student (II-S) and occupational (II-A) deferments.

It was just two years ago that the President signed Executive Order 10562 requiring that college students seeking deferment for graduate study stand in the top quarter of the senior class in college, or attain a score of 80 on the Selective Service College Qualification Test. College registrars, accustomed as they are to making out transcripts, might profitably add an appropriate space to the forms they use, to record the standing of each of the graduates. Failure

to provide this information in a transcript commonly leads to delay, unnecessary trouble, and sometimes a I-A classification for a student fully entitled to proceed with graduate study. Although there are several possible ways of recording the information, the best is the simple form: "Eleventh in a class of 100 male graduates."

Departmental advisors, graduate students, deans and others concerned with graduate studies should also keep in mind the fact that Selective Service requires evidence of formal registration in graduate school. In three cases that have come to our attention this summer, the students in question were actually and legitimately engaged in thesis research but were not enrolled in formal courses. The registrars in question had no record of registration that could be certified to Selective Service, and each of these three men were classified I-A for failure to observe a wise and necessary formality.

Undergraduates should give more thought to the wisdom of taking the Selective Service College Qualification Test, whether or not they plan to continue with graduate study. Men planning to enter the medical profession are required to pass it with a grade of 70 to qualify for deferment, whereas scientists and engineers must pass it with a grade of 80 or better if they wish to seek II-S deferment to remain in university after graduation. Although the men who stand in the top quarter of the graduating class are the ones most likely to make 80 on the SSCQT, many a student who has failed to qualify on class standing has made the grade on the examination. Yet the percentage of the draft-eligible college population taking the examination dropped from 32 percent in academic year 1950-51, when the test was first given, to 1.2 percent in academic year 1955-56.

Educators and employers should keep in mind the fact that the Reserve Act of 1955 has not superseded the deferment system either in education or in industry. To quote from a letter dated August 13, 1956, from Brigadier General Louis H. Renfrow, Deputy Director of Selective Service:

"The six months' critical skills reserve program has never been considered, and is not now considered, as a substitute for an occupational deferment program. As a matter of fact, the regulations require that upon the disapproval of an application for enlistment in the six months' critical skills reserve program the registrant's classification must be reopened and considered anew, giving ample opportunity at that stage in the Selective Service processing of the registrant for the registrant and his employer to establish eligibility of the registrant for new or additional occupational deferment."

And, it might be added, the six months' critical skills reserve program is normally not available to graduate students. Their recourse is II-S deferment.

• **General Motors Education Relations Section has announced publication of the 1955 edition of *General Motors Aids to Educators.*** Over 400 educational aids covering science, engineering, social studies, etc., available from G.M. are described in this catalogue which is a revision of a 1953 publication. The aids include those for which there is a nominal charge as well as those furnished free. They consist of booklets, charts, films, equipment, etc.

Distribution of the catalogue is normally limited to administrators, supervisors, department heads and college deans and others responsible for the review and procurement of supplementary teaching aids. It is not generally sent to individual teachers. Requests should go to General Motors Corporation, P.O. Box 77, North End Station, Detroit 2, Michigan.

• **The natural science faculty of Newark College,** Newark Division of Rutgers University is currently helping the regional high school teachers by arranging, in cooperation with the New Jersey Science Teachers Association, a series of seven free lectures in science.

• **The U. S. Office of Education has approved the first two contracts for cooperative educational research in its history.** The contracts, with Vanderbilt University and Indiana University, were made from an appropriation of $1,120,000 for research by colleges, universities, and state agencies in the problems of education. Indiana University will undertake an 18 months inevstigation to determine why only one-fourth of the top 10 percent of the state's high school graduates (in 1954-55) entered college. Studies will also be made on how many of the top 20 percent of the states 1955-56 high school graduates do not continue to college and why not. Christian W. Jung, associate professor of education and director of the university's summer session, will direct the $15,900 project. About one-third of the cost will be provided by Indiana University.

• **556 Merit Scholars and the colleges they are attending have received checks totaling $515,000 for the academic year 1956-57.** Sponsors for these freshmen are 23 business organizations and the National Merit Scholarship Corporation. Last year this group conducted the country's largest private scholarship competition—11,000 high schools entered nearly 60,000 of their best students in the competition. Seniors of 13,000 high schools are expected to enter the 1957 competition.

The nonprofit National Merit Scholarship Corporation was established in 1955 with initial grants of $20.5 million, which underwrote the corporation for a 10 year period. Besides providing nearly $2 million each year in scholarship awards, the Merit program is used by many companies who wish to grant Merit Scholarships on their own. The Merit Scholars are free to select any accredited college or university, and chose any course of study. Of this year's group, engineering and the physical science courses claimed 69 percent of the boys and 13 percent of the girls. Of the 556 winners, 72 percent are boys and 28 percent are girls.

• **The Atomic Energy Commission, Oak Ridge National Laboratory, and the Oak Ridge Institute of Nuclear Studies have announced that 102 scientists from Oak Ridge laboratories will be available on request to lecture, conduct seminars, and participate in colloquia at university campuses around the country.** This arrangement is made possible through the Oak Ridge Traveling Lecture Program, entering its ninth consecutive academic year. A brochure has just been issued on the program for 1956-57. Speakers who will participate are listed as well as some 165 lecture subjects. Additional information and brochures may be obtained from: Chairman, University Relations Division, Oak Ridge Institute of Nuclear Studies, Box 117, Oak Ridge, Tennessee.

• **Grants totaling $4,065,000 have been awarded by the National Science Foundation to 16 colleges and universities in the United States to support academic-year institutes** designed to help high school science teachers improve their knowledge of science subject matter. The Institutes will begin in September 1957 and enroll an estimated 750 high school science and mathematics teachers. The grants will provide stipends of $3000 each for approximately 50 teachers in each institute. Additional allowances for dependents and travel will also be provided.

Academic-year institutes are an outgrowth and extension of the summer Institute programs of the Foundation, now in their 5th consecutive year. Two academic year programs are currently in operation, at the University of Wisconsin and at Oklahoma A & M College. These are being renewed and 14 other new institutes being established. The institutes at the University of Chicago and the University of Illinois are for teachers of high school mathematics only. Following are the institutes for 1957 and the person to contact for further information:

Harvard University, Cambridge, Mass.
Dean Francis Keppel, Graduate School of Education

Ohio State University, Columbus 10, Ohio
Professor John S. Richardson, College of Education

Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma
Professor James H. Zant, Department of Mathematics

Oregon State College, Corvallis, Oregon
Professor Stanley E. Williamson, Department of Science Education

Pennsylvania State University, University Park, Pennsylvania
Mr. William H. Powers, Arts and Sciences Extension

Stanford University, Stanford University, Calif.
Professor Harold M. Bacon, Department of Mathematics

Washington University, St. Louis, Missouri
Dean T. F. Hall

University of Chicago, Chicago 37, Ill.
Professor E. P. Northrop, Department of Mathematics

University of Colorado, Boulder, Colorado
Professor William E. Briggs, Department of Mathematics

University of Illinois, Urbana, Ill.
Professor Joseph Landin, Department of Mathematics

University of Michigan, Ann Arbor, Michigan
Professor Freeman D. Miller, Department of Astronomy

University of North Carolina, Chapel Hill, North Carolina
Professor Edwin C. Markham, Department of Chemistry

University of Texas, Austin 12, Texas
Professor Robbin C. Anderson, Department of Chemistry

University of Utah, Salt Lake City, Utah
Professor T. J. Parmley, Department of Physics

University of Virginia, Charlottesville, Virginia
Professor James W. Cole, Department of Chemistry

University of Wisconsin, Madison 6, Wisconsin
Professor C. H. Sorum, Department of Chemistry

• **Application will be received until April 1, 1957, for scholarships to be awarded in the Pre-Collegiate Science Summer Program of the Worchester Foundation for Experimental Biology, at Shrewsbury, Mass.** This program, which is co-educational, holds a nine weeks session and consists of two groups of students—the first year division and the advanced students. Both groups reside together at St. Mark's School and attend lectures and demonstrations at the Worchester Foundation. To apply a student should be a junior or senior in high school. He or she should have an average of 85 percent or better in science and mathematics. One year of high school biology or chemistry or its equivalent is required. No student will be considered a candidate until the following have been received: (1) application form (2) science teacher's recommendation (3) at least two character references from qualified people (4) health certificate (5) a 200 word statement by the applicant on why he or she wishes to attend the school (6) consent of parent or guardian for student's application. The fee for the summer program has been set at $200. Since the total cost of the school runs to $900 per individual, this fee is considered nominal. For further details about the program and requirements, as well as application forms, write to: Mr. Frederick R. Avis, St. Mark's School, Southboro, Massachusetts.

• **The National Science Teachers Association has announced the publication of a new student magazine, *Tomorrow's Scientists.*** It is designed to bring to the junior and senior high school student recent advances in the scientific fields, information about science activities for students, career and guidance information, student-written reports of projects which show a high level of achievement, a science quiz, and announcements of new science books. Six issues will appear during the school year 1956-57. The subscription rate is 50 cents per subscription for the six issues, with a minimum of five copies ($2.50) to any one address. Orders should be addressed to: Tomorrow's Scientists, National Science Teachers Association, 1201 Sixteenth St., N.W., Washington 6, D. C.

• ***Employment Profile of Scientists in the National Register of Scientific and Technical Personnel, 1954-55,*** has just been issued by the National Science Foundation. The report is based on data from 94,000 scientists—27,000 chemists, 16,300 biologists, 12,200 psychologists, 11,800 geologists (including 3,400 geophysicists), 11,200 physicists, 6,700 chemical engineers, 5,400 mathematicians, 3,200 meteorologists, and 400 astronomers. 41 percent of the employed scientists in the Register hold a Ph.D. degree, 25 percent a master's and 32 percent a bachelor's or first professional degree (M.D., etc.).

Scientists at the doctorate level reported a median annual salary of $7000; those with less than a Ph.D. degree $6,125. Highest median salary was for Ph.D. physicists and meteorologists $7,850—while the lowest was for psychologists, $5,850. Biologists with Ph.D. degrees averaged $6,750, ranking fourth. (Physicists, meteorologists, geologists, biologists, mathematicians, astronomers.)

Approximately one-half of the employed scientists held industrial positions (private companies, self-employed, nonprofit foundations, and privately controlled research foundation). Almost one-third were employed by educational institutions; and the remaining 18% by the Government (Federal, State and local).

42% of the biologists in the Register were employed in research, development or field exploration; 22% in management or administration; 24.9% in teaching, and 2.4% in production.

About 7,000 women scientists were included, of whom 85% were in three fields —psychology, chemistry and biology. One fourth of the total women registered were in psychology. A total of 1,200 were in biology. The median age of the Register scientists, men and women, was 38. Biologists hit a median of 41, second only to astronomers whose median age was 42.

Limited numbers of copies of the complete bulletin from which this information was taken are available from: National Science Foundation, Washington 25, D. C.

Biology Library

One copy of each publication submitted for listing should be sent to the Editor, AIBS Bulletin, 2000 P Street, N.W., Washington 6, D. C. Only books published within a year of receipt will be reviewed. Books marked with an ★ are those published by Bulletin advertisers.

ANIMAL SCIENCES

★Parasites and Parasitism. THOMAS W. M. CAMERON. 322 pgs., 115 figs. John Wiley and Sons, 440 Fourth Ave., New York 16, N. Y. (1956) $6.75

One of North America's outstanding parasitologists is the author of this new text printed in Great Britain and distributed in this country by Wiley. No previous knowledge of parasitology is required by readers although a knowledge of biology in general most certainly is. The text fits best a senior course on the subject or early graduate work, since it deals with principles rather than practice. It would not be a text of choice for a medical or veterinary medical course. Parasites are discussed in three groups — Protista; lower Metazoa, which includes the helminths; and the higher Metazoa, in which parasitism is exceptional. Illustrations are adequate but not plentiful.

★Counseling in Medical Genetics. SHELDON C. REED. 268 pgs. W. B. Saunders Co., West Washington Sq., Philadelphia 5, Pa. (1955) $4.00

Most physicians receive little training in medical genetics. Most human geneticists are not in a position to dispense counsel on the subject. This small book, by the Director of one of the country's few human genetics institutes, is a handbook for doctors. Since the facts in the field are widely scattered in research journals, a considerable service has been done by gathering them together here in highly readable form. The book makes no pretense to completeness; it covers only those problems which occur most often. It is meant for daily use by the family physician who cannot consult experts in large medical centers.

★Practical Poultry Management. JAMES E. RICE and HAROLD E. BOTSFORD. 499 pgs., 224 figs. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. (6th edition, 1956) $4.25

It is difficult to imagine any aspect of poultry management that is not covered in this text. Since the book has been available in various editions since 1925, time alone would seem to indicate the wide use and acceptance of the contents. This sixth edition includes the results of recent research on poultry diseases, the energy values of feeds, NRC nutrient requirements, the most recent methods of packing and shipping, as well as quality standards, and harmonizing. Ample illustrations save words in many sections and convey an excellent picture of modern poultry practices.

Animal Agents and Vectors of Human Disease. ERNEST C. FAUST. 660 pgs., 216 illus. Lea & Febiger, Washington Sq., Philadelphia 6, Pa. (1956) $9.75

One of the most important phases of parasitology is the subject of this book—*Animal Agents and Vectors*, and their relation to human disease. The author is known internationally for his research in this field. Although the presentation is not exhaustive, etiology, epidemiology, pathogenesis, symptomatology, diagnosis, treatment, and control are considered in detail. Tables in the introductory chapters tell where each parasite under discussion is found, its usual infective stage, portal of entry, primary and secondary sites, usual reservoir hosts, and other obligate hosts and vectors. Illustrations are numerous and references conclude each chapter. The book should prove extremely useful to zoologists, epidemiologists, pathologists, practicing physicians, laboratory diagnosticians, and public health workers.

★Concise Anatomy. LINDEN F. EDWARDS. 502 pgs., 319 figs. McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. (2nd edition, 1956) $7.50

This book presents the subject of human anatomy in as interesting a way as possible. Chapters are in logical order: General Anatomy, The Superior Extermity, The Inferior Extremity, Anatomy of the Head, Anatomy of the Neck and Trunk, and Splanchnology. The illustrations are ample, varied, and largely from Morris. There is every reason to believe that *Concise Anatomy* will continue to hold its place among the top anatomy texts.

The Mammals of Keewatin. FRANCIS HARPER. 94 pgs., illus. University of Kansas Museum of Natural History Miscellaneous Publications. No. 12. Obtainable from the Arctic Institute of North America, 1530 P Street, N.W., Washington 5, D. C. (1956) $.75

Thirty-four mammals of the Keewatin district, Northwest Territories, Canada, are outlined in this small paper-bound handbook. Material includes sections on local distribution, taxonomy, ecology, economic relations, general life histories, and ectoparasites. An introductory chapter contains notes on the physiography, vegetation and comparative abundance of species in this territory.

Heredity and Your Life. A. M. WINCHESTER. 333 pgs., illus. Vantage Press, 120 W. 31st St., New York 1, N. Y. (1957) $5.00

Here is a highly readable, well illustrated presentation of human genetics—not for the student of genetics but for the average person. The author has succeeded in bridging the gap between the technical aspects of heredity and common understanding. Since the mechanism of heredity is so intimately linked with the process of reproduction, a portion of the book is devoted to this subject. The latter part of the book should be of value to ministers, social workers and others who are called upon to counsel—the tabulation of the mode of inheritance of many human characteristics should be of assistance in answering specific questions.

Starling's Principles of Human Physiology. Edited by SIR CHARLES LOVATT EVANS. 1233 pgs., 721 illus. Lea & Febiger, Washington Sq., Philadelphia 6, Pa. (12th edition, 1956) $12.50

A twelfth edition of any text would seem to indicate that the book is in demand, widely accepted, highly pertinent and has been so for a long time (this one since 1912). Only "classics" meet these conditions. The 12th edition has been considerably revised although with the scientific, rather than clinical point of view, maintained throughout. Some new illustrations have been added, as well as new formulae. The book remains one of the most comprehensive and accurate accounts of our present day knowledge of human physiology.

PLANT SCIENCES

★Diseases of Field Crops. JAMES G. DICKSON. 517 pgs., 102 figs. McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. (2nd edition, 1956) $8.50

Sixty virus diseases, 40 bacterial, and 300 fungal are listed in this volume and discussed in their relation to field crop plants. The discussion of each disease emphasizes the characteristics useful in identifying the disease, information basic to its control, with emphasis on the practical problems of crop rotation, adaptation, and the use of disease resistant varieties. This revised edition has been enlarged to include several new diseases as well as recent research in the field. The author, professor of plant pathology at the University of Wisconsin, is a well known authority.

★The Complete Book of Greenhouse Gardening. HENRY T. NORTHEN and REBECCA NORTHEN. 353 pgs., illus. Ronald Press Co., 15 East 26th St., New York 10, N. Y. (1956) $6.50

The authors of *The Secret of the Green Thumb* turn now to gardening under glass and supply the hobbyist, scientist and gardner with everything he needs to know. The book gives invaluable time- and money-saving advice on how to buy, equip, and locate a greenhouse. The management of a greenhouse, the control of temperature and light, and the elimination of diseases and pests are simply and completely discussed and illustrate the authors' wide experience in the subject. For more advanced gardners, instructions are given on modern methods of plant propagation, crossbreeding, and the control of shape, stature, and flowering. Most of the book is occupied by specific information on a wide variety of plants. Illustrations are plentiful, attractive and highly instructive.

Ferns and Fern Allies of Texas. DONOVAN S. CORRELL. 188 pgs., illus. Texas Research Foundation, Renner, Texas. (1956) $5.50

Because Texas occupies such a large portion of the southern part of the country, and borders Mexico for such a distance, the pteridophyte flora is unusually diverse and large. 51 of the 70 species of ferns and fern allies reported from northern Mexico are also found in Texas. Among the forty-eight states, the 107 species of ferns in Texas are only exceeded by the 120 found in Florida. This may be a surprising fact even to botanists. The author, who has published extensively in systematics and economic botany, is especially familiar with southern forms. His *Flora of Texas* appeared in 1944. At present Dr. Correll is with the Horticultural Crops Research Branch of the Agricultural Research Service, U.S.D.A.

House Plants—A Handbook. Edited by BESSIE R. BUXTON and PETER K. NELSON. Brooklyn Botanic Garden, Brooklyn 25, N. Y. (1956) $.60

This extremely useful and well illustrated handbook is one of a series on such practical subjects issued by the Brooklyn Botanic Garden. This particular booklet is a special printing of *Plants & Gardens*, Vol. 10, No. 3. Fourteen experts have contributed sections and the resulting information seems most complete, concise and comprehensive.

★The Guide to Roses. BERTRAM PARK. 288 pgs., 64 color plates, 16 figs. D. Van Nostrand Company, 120 Alexander St., Princeton, N. J. (1956) $5.95

This appears to be the last word on roses. Written by an English authority who is Editor of *The Rose Annual*, and author of all modern handbooks published by the British National Rose Society, the volume is an international manual. Over 1,350 varieties are described; all are in cultivation and available to amateur and professional alike. Ratings given individual roses by the British National Rose Society and the All-American Rose Society are provided. Introductory chapters deal with the history of the rose, soil preparation, cultivation, diseases, propagation, exhibiting and the rose in medicine. The 64 full color plates are superb—the majority are photographs taken by the author.

Wheat-Climate Relationships and the Use of Phenology in Ascertaining the Thermal and Photo-thermal Requirements of Wheat. M. Y. NUTTONSON. 388 pgs. The American Institute of Crop Ecology, 809 Dale Drive, Silver Spring, Md. (1955)

The American Institute of Crop Ecology undertakes studies that endeavor to integrate knowledge of the behavior of

plant organisms, under field conditions, with environment. This particular study, evidently one of several that attempts to make use of phenological data and meteorological records, analyzes existing data in the wheat-growing areas of North America with some areas of the Soviet Union and Finland which are analogous to these areas in their thermal and latitudinal environments. Various comparisons are made including temperature summations, photothermal units required to bring wheat to heading and maturity, and day-degree requirements.

MISCELLANEOUS

A Practical Manual of Medical and Biological Staining Techniques. EDWARD GURR. 451 pgs. Interscience Publishers, 250 Fifth Ave., New York 1, N. Y. (2nd edition, 1956) $6.25

In the author's own words, "This book has been written because it is felt that there is an urgent need of a practical manual dealing with all or most branches of microscopic staining, entirely divorced from theory and general statements." This second edition contains a new section on histochemical methods as well as general additions. The contents are presented in a minimum of space and with a maximum of detail and clarity. The author is an English scientist of considerable renown in this field.

Recent Progress in Hormone Research. Vol. XII. Edited by GREGORY PINCUS. 452 pgs., illus. Academic Press Inc., 111 Fifth Ave., New York 3, N. Y. (1956) $10.00

Volume XII of *Recent Progress* is composed of papers presented at the twelfth annual Laurentian Hormone Conference, held in September, 1955, at Estes Park, Colorado. Discussions that followed each paper are included as well as a subject and author indexes. Those familiar with this outstanding series of Conferences will find the 1955 subject matter up to the usual high standards and with the usual wide scope. Authors include: *I. Hormone Biosynthesis and Metabolism:* Jean Roche, Raymond Michel, Paul Hagen, A. D. Welch, R. D. H. Heard, E. G. Bligh, M. C. Cann, P. H. Jellinck, V. J. O'Donnell, B. G. Rao, J. L. Webb, M. Hayano, N. Saba, R. I. Dorfman, O. Hechter, G. M. Tompkins, K. J. Isselbacker; *II. Hormones and Metabolism:* G. S. Gordon, J. A. Leutscher, Jr., M. E. Drahl; *III. Pituitary Hormones:* A. Albert, A. B. Lerner, Yoshiyata Takahashi, R. F. Escamilla; *IV. Sex Hormones:* T. Mann, R. B. Leach, W. O. Maddock, I. Tokuyama, C. A. Paulsen, W. O. Nelson, Arpad Csapo.

The Classification of Lower Organisms. HERBERT F. COPELAND. 302 pgs., 45 figs. Pacific Books, Box 558, Palo Alto, California. (1956) $7.50

In this book the author resumes the endeavor of Haeckel and his predecessors to establish a satisfactory system of kingdoms that would do something for the "in betweens." Four kingdoms are proposed: Kingdom I, Mychota (organisms without nuclei such as bacteria and blue-green algae); Kingdom II, Protoctista (nucleate organisms such as protozoa, red and brown algae, and fungi); Kingdom III, Plantae; Kingdom IV, Animalia. The first two kingdoms form the subject matter of this volume. The treatment offered will doubtless raise considerable discussion among systematists.

★Family Medical Costs and Voluntary Health Insurance: A Nationwide Survey. ODIN W. ANDERSON and JACOB J. FELDMAN. 251 pgs., illus. The Blakiston Division, McGraw-Hill Book Company, 330 West 42nd St., New York 36, N. Y. (1956) $6.50

For the first time on a national basis the voluntary health insurance plans have been surveyed—by the National Opinion Research Center of the University of Chicago, with the financial support of the Health Information Foundation. This book offers the new and original data emerging from the study. It shows the relative proportions of health insurance by type of service and type of insurer, and the distribution of insurance by region, residence, age, sex and related factors. It provides statistics for answering two questions: how to expand voluntary health insurance in terms of people covered and how to expand in terms of benefits offered.

A Study of Thinking. JEROME S. BRUNER, JACQUELINE J. GOODNOW and GEORGE A. AUSTIN. 330 pgs. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. (1956) $5.50

Scientists and psychologists alike will be interested in this publication of an extensive program of research at Harvard University, on theoretical and experimental analysis of inference and thinking. How people utilize cues for inferring the nature or "meaning" of events is one of the most basic decision processes in thinking. An adequate strategy for utilizing cues involves learning how to make sequences of such decisions, sequences that fully utilize available information, that minimize cognitive strain, and that regulate outcome risks. The book is unique in treating in a common framework such conventionally separate topics as conceptualizing, perceptual identification, decision making, probability learning, and judgment. An appendix by R. W. Brown applies the general theory presented in the book to phenomena of linguistics in general and to psycholinguistics in particular.

★Soil Fertility and Fertilizers. SAMUEL L. TISDALE and WERNER L. NELSON. 430 pgs., illus. The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. (1956) $7.75

The authors intend this book to be used by agriculture students at the junior or senior levels in college, following a basic course in soils. The material is presented in the following sequence: historical introduction; elements required in plant nutrition, their role in growth and soil reactions that make these nutrients available to crop plants; manufacture, properties and agronomic value of fertilizers and fertilizer materials; and soil fertility evaluation and the use of fertilizers in sound management programs. A list of questions appears at the end of each chapter—questions designed to fix principles in mind and aid the student in thinking through problems. Both authors are on the faculty of North Carolina State College.

The Search Beneath the Sea. J. L. B. SMITH. 260 pgs., illus. Henry Holt and Co., 383 Madison Ave., New York 17, N. Y. (1956) $3.95

May we recommend this book to every biologist? First, because it is the story of the most sensational scientific discovery of this century and secondly, because it reads as well as the most fascinating novel. Probably only a few thousand people in the world knew the meaning of the word "Coelacanth" in 1938. But from the time the first specimen was hauled out of the water off the coast of South Africa in December of that year, the word has travelled and travelled. Believe to have been a fossil for fifty million years, the appearance of a live Coelacanth set the world's ichthyologists on their respective ears and started the author on a fourteen year search for another specimen. The story of this search, a wild-goose chase against incredible odds and the scepticism of the scientific world, is completely absorbing and luckily amusing at times. It is the story of a fantastic fish, and of a man who was, in his own words, "a hare-brained scientist" but who, by his single-minded perseverance, won for himself a permanent place in the annals of science.

Vitamins and Hormones. Advances in Research and Applications. Vol. XIV. Edited by R. S. HARRIS, G. E. MARRIAN and K. V. THIMANN. 486 pgs., illus. Academic Press Inc., 111 Fifth Ave., New York 3, N. Y. (1956) $10.00

The eight chapters of Vol. XIV of *Vitamins and Hormones* have been prepared by fourteen authors from three countries, Great Britain, Germany and the U.S.A. Subjects include: Intestinal Synthesis of Vitamins in the Nonruminant; Some Aspects of Vitamin A Metabolism; Regulation of Carbohydrate Metabolism in Isolated Tissues; Experimental Hyperglycemic States Not Primarily Due to a Lack of Insulin; Biochemical Studies on Insect Hormones, Glucuronide Metabolism with Special Reference to the Steroid Hormones; Bioassay of Pituitary and Placental Gonadotropins in Relation to Clinical Problems in Man; and Microbiological Transformations of Steroids and Their Application to the Synthesis of Hormones. The article on insect hormones is probably the first published summary of the very recent work on the biochemistry of these substances.

Advances in Cancer Research. Vol. IV. Edited by JESSE P. GREENSTEIN and ALEXANDER HADDOW. 416 pgs. Academic Press Inc., 111 Fifth Ave., New York 3, N. Y. (1956) $10.00

Contributors to this fourth volume of *Advances in Cancer Research* are: S. Farber, R. Toch, E. M. Sears and D. Pinkel, Advances in Chemotherapy of Cancer in Man; D. A. G. Galton, The Use of Myleran and Similar Agents in Chronic Leukemias; A. Goldin, The Employment of Methods of Inhibition Analysis in the Normal and Tumor-Bearing Mammalian Organism; O. A. Gorer, Some Recent Work on Tumor Immunity; G. Grobstein, Inductive Tissue Interaction in Development; F. L. Haven and W. R. Bloor, Lipids in Cancer; A. Lacassagne, N. P. Buu-Hoi, R. Daudel and F. Zajedla, The Relation between Carcinogenic Activity and the Physical and Chemical Properties of Angular Benzacridines; and O. Muhbock, The Hormonal Genesis of Mammary Cancer.

★Medicine in Action. MARGARET O. HYDE. 160 pgs., illus. (Whittlesey House Books for Young People) McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. (1956) $2.75

Books for young people do not often come to the *Bulletin* for review so we are somewhat unfamiliar with current publications and the range of subjects offered. *Medicine in Action* seems to us an excellent account of the various careers open in the field of medicine and a fine word-picture of just what medicine encompasses today. The surgeon mending a human heart, a medical technologist working with microscopic material, nurses in hospitals and foreign fields, a bacteriologists searching for a new drug are all pictured as part of the modern health team. New developments in medicine and future possibilities are outlined in an interesting way. Career information that will guide the curious to further reading, is found at the end of the book.

Advances in Agronomy. Vol. VIII. Edited by A. G. NORMAN. 423 pgs. Academic Press Inc., 111 Fifth Ave., New York, N. Y. (1956) $8.80

As with all previous volumes in this series, the overall objective of surveying and reviewing progress in agronomic research and practice has been maintained but the diversity and breadth of the material is impressive. The empiricism of agronomic research in the past has given way to highly rational approaches and these papers reflect the trend. A chapter on grass breeding and one on recommendations for economic applications of fertilizer and lime are particularly indicative of activity in the field. Once again a regional survey is included—this time the "new agricultural empire" of the Pacific Northwest states.

The Future of Arid Lands. Edited by GILBERT F. WHITE. 453 pgs., illus. American Association for the Advancement of Science, 1515 Massachusetts Ave., Washington 5, D. C. (1956) $6.75 ($5.75 to AAAS Members)

Representatives from 28 countries met in April 1955 in New Mexico to consider the present state of research and development on arid zone problems and to formulate recommendations for new lines of research. Leaders from 18 of the countries represented gave papers at the symposium. These symposium papers and the 31 Conference recommendations are reproduced in this volume. The breadth and scope of the Conference are indicated by the groupings of the recommendations: Anthropology, Archaeology and Geography; Meteorology and Climatology; Hydrology, Geology and Soils; Biology; Ecology and Conservations; Organization, Communication, and Interdisciplinary Programs. Nonspecialists should find the papers as interesting, thought-provoking and significant as scientists will.

★An Introduction to Cybernetics. W. ROSS ASHBY. 295 pgs., illus. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. (1956) $6.50

Cybernetics is the application of methods control and communication theory to the analysis of how things are done. In biology this means possible analyses of coordination, regulation and control. This book is written for the biologist who wishes to learn the new language either for his general edification or for possible application to his problems. It begins at the beginning of the subject in simple language and progresses by easy but many steps to the development of cybernetics as a tool in analyses of biological processes. Although simply presented, the novelty of approach will require diligent application with no omissions. But it does offer a treatment any biologists from the level of senior in college on up can follow and by which he can ultimately obtain an appreciation of the subject. *A. G. Richards*

★Handbook of Biological Data. Edited by WILLIAM S. SPECTOR. 584 pgs. W. B. Saunders Co., West Washington Sq., Philadelphia 5, Pa. (1956) $7.50

Elsewhere in this issue of the *Bulletin* a complete and authoritative survey of the *Handbook* appears. Suffice to say here that the publication of the volume should be greeted with enthusiasm by biologists. The need of such a volume has long been known. The immensity of the task and the necessary financial support both contributed to the delay in appearance. The tables in the *Handbook* represent the actual correlated contributions of more than 4,000 scientists and the counsel of an additional 13,000! The editor and his staff deserve the thanks and support of all biologists for this tremendous compilation of so much exacting data.

Administrative Medicine. Edited by GEORGE S. STEVENSON. 251 pgs. Josiah Macy Jr. Foundation, 16 West 46th St., New York 36, N. Y. (1956) $4.25

The Josiah Macy Jr. Foundation, continuing its policy of arranging multiprofessional conferences, turned for this subject to an area where science crossed business and economics. This is the fourth conference on *Administrative Medicine* and the following subjects were considered during the meeting: Measuring Needs for Medical and Related Services; R. E. Trussell and J. Elinson; Health Insurance Plan for Greater New York, G. Baehr; Assessment of Quality of Services in a Group Practice Prepayment Plan, P. M. Densen; Assessing Effectiveness of Programs in Operation, M. C. Sheps; A Study of Quality of Medical Care, I. O. Woodruff, and Assessment of Quality of Services in the Boston Metropolitan Area, L. S. Rosenfeld.

Glaucoma. Edited by FRANK W. NEWELL. 251 pgs. Josiah Macy Jr. Foundation, 16 West 46th St., New York 36, N. Y. (1956) $4.50

In introductory remarks, P. C. Kronfeld, Chairman, writes "It was for two reasons that the subject of narrow angle or iris-block glaucoma was chosen as one of the topics for discussion. In the first place, I thought that this subject would lend itself to the interdisciplinary approach which is the keynote of these conferences. One other reason . . . narrow angle glaucoma is an excellent example of what I would call convergence of views, a convergence that started a few years ago and has brought us to a point where there is a most remarkable state of agreement." Three papers compose the volume, and as usual the group interchange following each paper is reported in full.

Our Hormones and How They Work. SARAH R. RIEDMAN. 168 pgs., illus. Abelard-Schuman Ltd., 404 Fourth Ave., New York 16, N. Y. (1956) $2.50

Dr. Riedman is a biologist who has turned to writing for teenagers about the amazing world of science. In this small volume the exciting story of hormones and how they work is told. Readers are taken into the laboratory where discoveries are made and the men who made them become real. At no time is the young reader "talked down to." Instead scientific words and terms are introduced when appropriate and simply explained. College students who are not studying biology and laymen as well could benefit from and find interesting *Our Hormones and How They Work*.

★Medical Sciences. Vol. I. Progress in Nuclear Energy. Edited by J. C. BUGHER, J. COURSAGET, and J. F. LOUTIT. 165 pgs. McGraw-Hill Book Co., 330 West 42nd St., New York, N. Y. (1956) $6.00

This is Volume I of the Medical Sciences Series in a new McGraw-Hill publication venture, *Progress in Nuclear Energy*. The Geneva Conference released a flood of information that had been acquired in various countries by new tools and new techniques but until then shrouded in "security." This series will contain articles by international experts on many aspects of nuclear energy as they affect the medical sciences. Authors and subjects of Vol. I include: E. H. Belcher and W. V. Mayneford, Radioactive Isotopes in Medical Diagnosis; J. F. Ross, The Diagnosis and Investigation of Disease with Radioactive Isotopes; J. S. Mitchell, Nuclear Radiations for Radiotherapy with External Sources; J. S. Mitchell, Radioactive Materials for Internal Therapy; W. Binks, Principles and Standards of Radiation Safety; A. J. Cipriani, Health and Safety Activities in Reactor and Chemical Processing Plants; and G. Failla, Dosimetry in Ionizing Radiation.

★Biological Sciences. Vol. I. Progress in Nuclear Energy. Edited by J. C. BUGHER, J. COURSAGET, and J. F. LOUTIT. 205 pgs. McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. (1956) $7.00

The first volume of the Biological Sciences series touches on every phase of the relation of man to his environment. The productivity of the land and sea, the conversion of solar to chemical energy by ways of enzyme systems, the pace of evolution, are all areas of investigation that have been opened by radioactive tools. Also in this volume the problems of the operation of nuclear facilities, of personnel protection and of environmental radioactive contamination are considered in detail. These problems have been of concern for some time in relation to nuclear industry but only recently in relation to the general population.

The Foundations of Science. SHELDON J. LACHMAN. 130 pgs. The Hamilton Press, 800 Fox Bldg., Detroit 1, Mich. (1956) $1.50

The author states in his preface, "The fundamental objective of this brief monograph is to outline the more apparent explicit characteristics of science." Since the book is designed to orientate the college student in the essentials of science it can be used as supplementary reading or as an introductory statement for elementary science courses, general education science offerings or perhaps in classes concerned with the philofophy of science.

National Library of Medicine. Classification. 314 pgs. For sale by Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. (2nd edition, 1956) $2.00

This publication provides a shelf classification for medical books, rather than a classification of medicine, and the second edition offers a thorough revision designed to simplify the tables, make provisions for new concepts and developments, and incorporate the changes that have occurred since the first edition appeared in 1951.

★pH Measurements. VICTOR GOLD. 125 pgs. John Wiley & Sons. 440 Fourth Ave., New York 16, N. Y. (1956) $2.25

This pocket-size book was prepared for non-specialists but offers a rigorous and highly inclusive treatment of the subject of pH. Chemists and biologists alike should find it a useful addition to their laboratories.

Symposium on Structure of Enzymes and Proteins. Edited by ALEXANDER HOLLAENDER. 294 pgs. Biology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee. A limited number of copies are available free of charge to scientific investigators who can establish their need for the publication.

This symposium was held at Gatlinburg, Tennessee, in April 1955 under the sponsorship of the Biology Division of the Oak Ridge National Lab. The subject was chosen because of its fundamental importance "to an understanding of the functions of living cells and basic to the study of the effects of radiation on living organisms." Speakers and their topics are: Felix Haurowitz, The Nature of the Protein Molecule: Problems of Protein Structure; Henry Borsook, The Biosynthesis of Peptides and Proteins; P. C. Zamecnik, E. B. Keller, J. W. Littlefield, M. B. Hoagland, and R. B. Loftfield, Mechanism of Incorporation of Labeled Amino Acids into Protein; Walter Kauzmann, Structural Factors in Protein Denaturation; H. Fraenkel-Conrat, Chemical Studies on Enzymes and other Proteins; Eric Ellenbogen, The Effect of Optical Configuration of Amino Acid Residues on the Physical Properties of Peptides; John T. Edsall, Configuration of Polypeptide Chains and Protein Molecules; Birgit Vennesland, Steric Specificity of Hydrogen Transfer in Pyridine Nucleotide Dehyrogenase Reactions; Daniel E. Koshland, Jr., Molecular Geometry in Enzyme Action; and Robert A. Albert, Kinetic Effects of the Ionization of Groups in the Enzyme Molecule.

LABORATORY MANUALS

The Dissection of the Cat. BRUCE M. HARRISON. 217 pgs., illus. The C. V. Mosby Co., 3207 Washington Blvd., St. Louis 3, Mo. (3rd edition, 1956) $3.50

A.I.B.S. Reports

• **Under a grant from the National Science Foundation, AIBS has begun a program of Russian translations in the biological sciences.** The grant will subsidize the translation, printing and distribution of four Russian research journals: *Proceedings of the Academy of Sciences of the USSR (Doklady)*, Biological Sciences Section and Botanical Sciences Section: *Microbiology*; and *Plant Physiology*. Because of the grant, subscription prices have been substantially reduced. Prices appear on page 30. Inquiries and subscription orders should be sent to the AIBS office.

• **Applications in the AIBS Life Plan** have been increasing at a gratifying rate. If this trend continues, the underwriting insurance company expects to be able to put the Plan into effect in the very near future.

• **The American Society of Zoologists, through AIBS, recently received a grant from the National Science Foundation, for the establishment of a Policy Study Committee.** The Committee held its first meeting in the AIBS office in November 1956. The chairman of the Committee is John Buck.

• **An AIBS *ad hoc* Advisory Committee in Systematic Biology to the National Science Foundation,** met in Washington, D. C., December 7-8, 1956. The following biologists served on the Committee: Ernst May (chairman), William Steere, Theodor Just, Oswald Tippo, Alfred Emerson, Charles Michener, Victor Twitty, Karl Schmidt, Sidney Blake, and G. G. Simpson.

• **To advise the National Science Foundation on Controlled Environment Research in the Plant Sciences, an *ad hoc* Committee has been formed** by AIBS to meet in February 1957. K. V. Thimann will serve as chairman and the Committee members are: Frank Brink, Ralph E. Cleland, Paul Kramer, G. Ledyard Stebbins, Jr., S. B. Hendricks, A. G. Norman and F. W. Went.

• **AIBS has acquired the rights to *The Quarterly Review of Biology*** from William and Wilkins, Baltimore publishers, effective January 1, 1957. The printer will continue to be Waverly Press, Baltimore. The editorial staff will remain unchanged for the present; the Editorial Board will become an Advisory Board, serving through an enlarged AIBS Editorial Board. Special reduced subscription rates are available to members of AIBS Member Societies and to individual members of the Institute. The regular subscription price is $7.50 per year; AIBS price, $6.50. Subscriptions will be handled though the AIBS office.

• **The January 1957 list of registrants in the AIBS Placement Service will be available to employers by the time this issue of the *Bulletin* appears.** The cost is $1.00 per copy. Approximately 100 biologists are registered in the current list. Employers who have available positions are invited to contact the Director, AIBS Placement Service, any time during the year.

• **An AIBS *ad hoc* Selection Committee has been appointed by the following societies, to advise the National Science Foundation on travel grants to the 9th International Congress of Cell Biology,** to be held in Scotland in August 1957: Botanical Society of America, American Society of Plant Physiologists, American Society of Zoologists, Society of General Physiologists, American Physiological Society, Society for the Study of Development and Growth, Tissue Culture Association and American representatives of the International Society of Cell Biology.

• **An AIBS *ad hoc* Committee on the Status and Future Trends of Research in Biological Orientation, advisory to the Office of Naval Research,** met in New York in December 1956, under the chairmanship of Otto H. Schmitt. Other members of the Committee were: Harry Harlow, Sherman Ross, Theodore C. Schneirla, Theodore Bullock, and Pinckney J. Harmon, Jr.

• **The first publication, "Molecular Structure and Functional Activity of Nerve Cells",** edited by Robert G. Grenell and L. J. Mullins, in a new AIBS series of Symposium Proceedings, appeared this month. For details about the volume and how to order copies, please consult page 44.

• The AIBS "family" of societies welcomes a **new Affiliate** member this month, **The American Society of Animal Production.** This Society includes those biologists interested in animal and poultry breeding research. Current officers are: President: L. E. Cassida; Vice-president: J. C. Miller; Secretary-Treasurer: W. M. Beeson, Purdue University, Lafayette, Ind.; Editor, *Journal of Animal Science*: *J. K. Loosli.*

• **A new Associate** has also joined AIBS, effective January 1957—**Ward's Natural Science Establishment,** Rochester, N. Y. One of the oldest supply houses of biological products, Ward's has exhibited with AIBS for some time and should be a familiar name to all biologists.

• **The Atomic Energy Commission, through a contract with AIBS, has augmented the AIBS Visiting Lecturer's Bureau** by providing an additional twenty man-weeks of lectures, on radiation biology and the use of isotopes as research tools. This considerably expands the scope of the Lecturer's Bureau program and supplies experts in an important new era of biological research.

• **The AIBS Editor's Conference,** discussed in some detail by the Conference Director, Fred Cagle (page 28) has been arranged for the first week in April, 1957, at New Orleans, La. The exact dates and the names of those selected to attend, will appear in the April *Bulletin.*

• **The second AIBS Conference on Aging** will be held at Gatlinburg, Tenn., May 1-3, 1957, at the Mountain View Hotel. Further details about this Conference, too, will appear in the April issue.

• **The 1957 annual AIBS meeting will be held at Stanford University, Palo Alto, California, August 25-30.** The 1958 meeting will be at Indiana University, Bloomington, Indiana, August 24-29.

CALLING ALL PHOTOGRAPHERS . . .

Bulletin readers who have good collections of biological photographs, are urged to submit samples for possible use as Bulletin cover photos. Photographs should be in black and white, on glossy paper, and carry a brief description of the subject as well as the photographer's name and address.

USES AND ADVANTAGES OF THE NSF NATIONAL REGISTER OF SCIENTIFIC AND TECHNICAL PERSONNEL

Since all information provided by the registrant is punched on IBM cards, statistical runs are easily made. Some of the uses of this information are:

Salary—the government rectifies inequities in salary between persons employed in industry and in government by using these figures as the basis for recommendations to Congress for salary raises;

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Receipt of travel grants to attend symposia, international congresses and other scientific meetings,
Consultancies.

The Register has been in operation since 1953. Of a possible 60,000 registrants in biology, only 30,000 have responded and only 20,000 have been eligible for inclusion in the Register. Needless to say, the greater the number of biologists registered, the greater will be the value of the Register to the individual biologist, the various participating societies and to the field of biology as a whole.

A new questionnaire has been compiled which corrects deficiencies discovered in the earlier form. ALL biologists, whether registered or not, are being sent a copy. PLEASE COMPLETE AND RETURN YOUR NEW QUESTIONNAIRE PROMPTLY!

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The first book in a new series of AIBS publications is now available (January 1957). A second will be ready in March. Both contain complete proceedings, including discussions, of two symposia sponsored by the Office of Naval Research and arranged by AIBS.

Molecular Structure and Functional Activity of Nerve Cells

Edited by R. G. GRENELL *and* L. J. MULLINS

Chemoreceptor Mechanisms, V. G. Dethier; Visual Receptors as Biological Transducers, E. F. MacNichol, Jr.; Affinity for Wool as an Indicator of Neuropharmacological Activity, R. Fischer; Oxygen Utilization in Sympathetic Ganglia, M. G. Larrabee and P. Horowicz; The Structure of Nerve Cell Membranes, L. J. Mullins. Discussants: W. D. McElroy, P. W. Davies, and R. G. Grenell.

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Edited by LINUS PAULING *and* H. A. ITANO

Molecular Complementariness in Antigen-Antibody Systems, D. Pressman; Nature and Formation of Antibodies, F. Haurowitz; Specific Attraction Between Identical Macromolecules, H. Jehle; Hydrogen Binding, J. Donohue; Intermolecular Forces, J. O. Hirschfelder; Interaction of Organic Molecules with Proteins, I. M. Klotz; The Effect of Dye Structure on Affinity for Fibers, H. E. Schroeder and S. N. Boyd; On the Structural Basis of Ribonuclease Activity, C. B. Anfinsen and R. R. Redfield; Molecular Shapes, Especially Orientation around Single Bonds, K.S. Pitzer; Specificity and Inhibition of Fumarase, R. A. Alberty; Specificity in the Interaction of Sickle Cell Hemoglobin Molecules, H. A. Itano; Specificity in Cholinesterase Reactions, I. B. Wilson.

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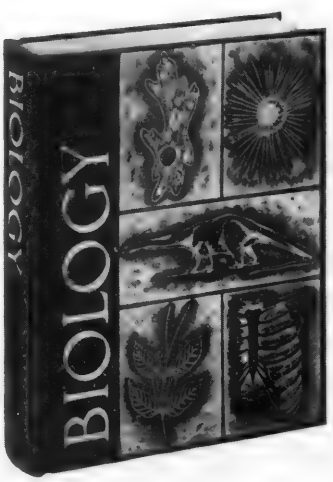

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PLANT PROPAGATION

By JOHN P. MAHLSTEDE *and* ERNEST S. HABER, *both of Iowa State College.* Combines both the basic principles and the practical details of successful plant propagation. Emphasis is placed on *why* a particular method is used in propagating a plant either sexually or asexually. Among the modern technological developments treated in this volume are the use of hormones for speeding up the rooting of cuttings; the use of substitute media such as vermiculite and volcanic ash; and the production of seeds by special techniques, as used for hybrid corn and hybrid snapdragons. Significant advances are described in processing seeds, as well as in methods used for rapidly increasing vegetatively propagated plants in mist houses and outdoor mist frames. *1957. Approx. 435 pages. Prob. $7.50.*

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By HERBERT H. ROSS, *University of Illinois.* This revised edition reflects the notable advances of the past decade in insect physiology, insect ecology, and insect evolution and paleo-ecology. The chapter on Arthropoda and their allies has been almost entirely rewritten, as well as many sections on physiology. The second edition includes enlarged and reworked keys to orders of insects. Most of the material on geological history has been revised. In addition, much of the author's coverage of the ecological aspects of the subject has been changed in the light of recent ideas. The text continues to stress a balanced coverage of all entomological topics, integration of this material with the general concepts of biology, and an evolutionary presentation wherever possible. *1956. 519 pages. $7.75.*

FERTILIZATION

By LORD ROTHSCHILD, *G.M., Sc.D., F.R.S.* The first general survey of this field in more than twenty-five years. Its treatment is physiological, using this term in its widest sense, but considerable space is devoted to what is actually seen through the microscope when mammalian eggs and those of lower organisms are fertilized. Discussing the biochemistry and biophysics of fertilization in detail, the book provides a fuller treatment of the biochemical aspects than has ever been available in the modern literature. An unusual feature is a list of some experiments in the field which have not yet been performed. An index of plants and animals is also included, giving their Latin names, synonyms, English names, classes, and orders. *1956. 170 pages. $3.50.*

AN INTRODUCTION TO CYBERNETICS

By W. ROSS ASHBY, *Director of Research, Barnwood House, Gloucester.* A clear account of cybernetics, especially suitable for readers in biological fields. Starting from commonplace and well-understood concepts, Dr. Ashby proceeds step by step to show how these concepts can be developed until they lead into such subjects as feedback, stability, regulation, ultrastability, information, coding, noise, and other cybernetic topics. No knowledge of mathematics is required beyond elementary algebra. The illustrations and examples are almost all taken from the biological rather than the physical sciences. *1956. 295 pages. $6.50.*

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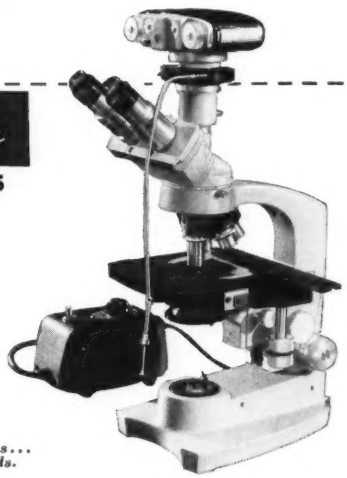

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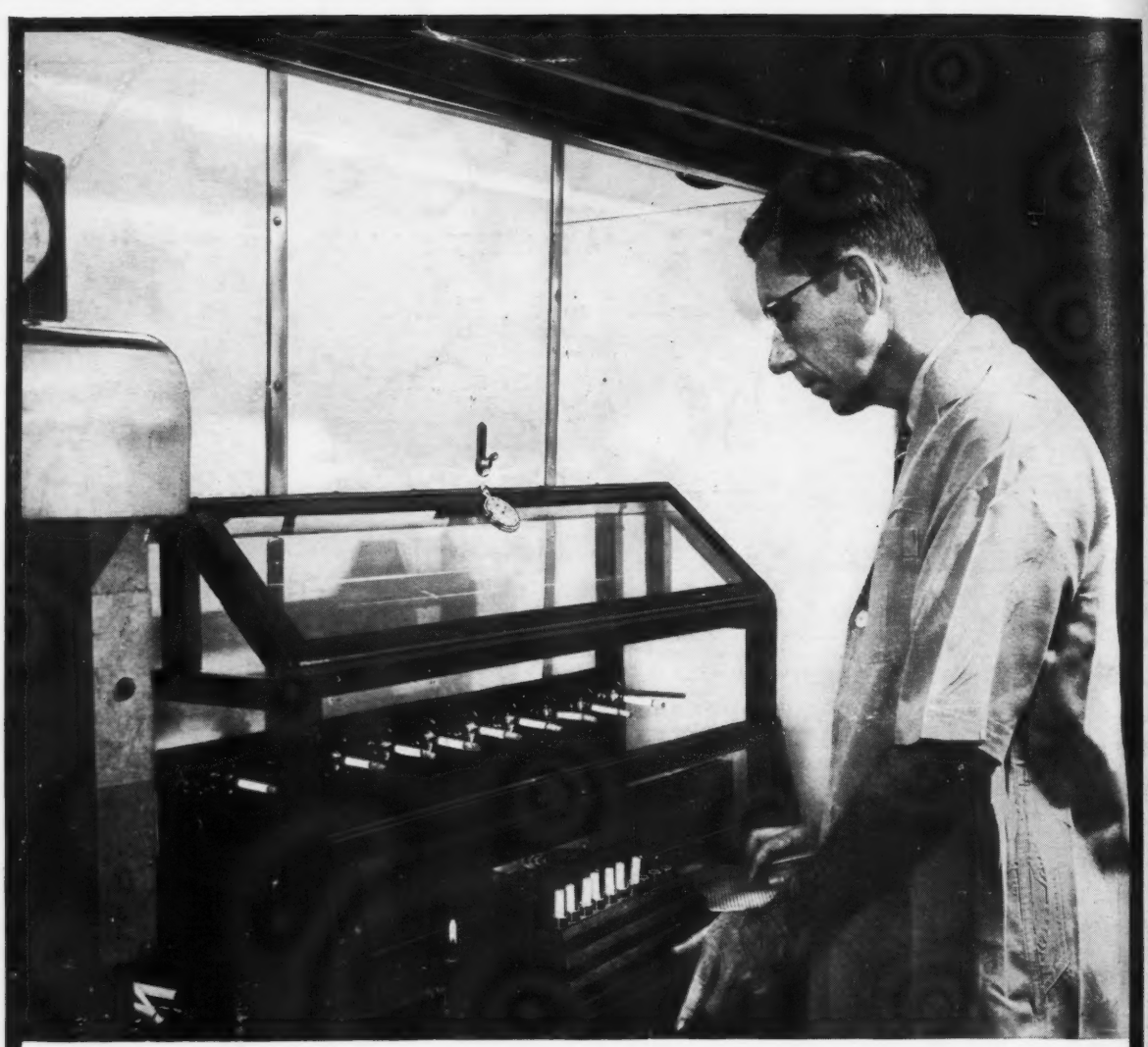

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The slowest ones lose, too.

In a manner of speaking, these cigarettes are being "clocked" for speed in the Research Laboratory of The American Tobacco Company. Burning rate is an important attribute of quality in a cigarette. It is determined by recording the time required for a measured length of the cigarette to burn away in still, conditioned air.

The results are actually a measure of the cigarettes' *taste*. You see, when a cigarette burns too fast, it tastes hot and dry. If it's a slow burner, taste is also impaired. The American Tobacco Company's cigarettes have a correct burning rate. And repeated testing makes sure that they stay within the established standards.

If you multiply this laboratory operation by hundreds of others performed daily in this famous laboratory, you'll have a good idea why The American Tobacco Company's brands are cigarettes of superior quality.

The American Tobacco Company

FIRST IN CIGARETTE RESEARCH

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